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NAMBOUR—BLACKALL RANGE.

Agriculture.

THE BLACKALL RANGE.

NAMBOUR, DULONG, AND MAPLETON.



exploitation of distant unknown lands has always had a peculiar charm for the Anglo-Saxon race, whether for the sake of their commercial possibilities in the direction of minerals, forests, agricultural or pastoral lands, or for the mere gratification of curiosity and the love of adventure. That "distance lends enchantment to the view" has been well exemplified in the exploration of New Guinea, in the prospecting of arid deserts in Western Australia in satisfaction of the *sacra james auri*, and in our own State in the gradual exploration and settlement of the rich agricultural lands of the far North, particularly of the Johnstone River, and of Cairns and the surrounding district. Cairns is over 900 miles from Brisbane, yet once the capabilities of the rich soil of the vast scrubs covering the country all along the coast for 100 miles and the slopes of the hills inland to the tableland were made known—when extensive areas of magnificent cedar, beech, and pine trees were discovered—then the district went ahead with marvellous rapidity. The most expensive railway in the State, costing over a million of money, was carried over the precipitous coast range, roads and bridges were constructed, sugar-mills were erected, wharves and telegraph lines were built, and, in fact, this far-away district had more public money expended on it than almost any other agricultural district in the State. Subsequent results have quite justified this expenditure of both public and private money. If money was poured into the North, money also poured out of it in the form of sugar, coffee, and other tropical productions; timber, gold, and other metals contributed their quota, the North thus paying ample interest on the capital expended there; and these Northern districts are now as well known and as accessible as the Darling Downs, and equally celebrated for the richness of the land, its marvellous productive capacity, the output of valuable commercial products, and, not least, for the exquisite beauty of the coast and mountain scenery. Yet they are nearly 1,000 miles distant from Brisbane.

We are led to this retrospect in consequence of a trip which we lately took into the heart of a vast district, which is as unknown to the majority of Queenslanders and residents of the other States of the Commonwealth as if it were situated in Central Africa. This district possesses in the fullest degree all the physical advantages of the Northern land. Its scrub lands are as rich and as extended; its timbers as various, as plentiful, and as valuable; its climate temperate and equable; its rainfall ample. There is no product of the soil of Queensland which cannot be raised there to perfection. Sugar, coffee, cotton, bananas, pineapples, citrus fruits, grapes, strawberries, and a host of other fruits; maize, wheat, barley, oats, lucerne, potatoes, and all garden vegetables thrive as well as on the Darling Downs or in the Central and Northern districts.

The similarity between this portion of the State and that lying between Cairns, the Barron Falls, Mareeba, Atherton, and the Mulgrave and Russell Rivers is most striking, as we shall presently show.

"Where is this beautiful country? It must be a very long way from Brisbane," say the metropolitans. It is just so far from Brisbane that a day's ride on a good horse will land you there. Four hours' railway travelling brings you to the very heart of the district—the picturesque little township of Nambour, on the North Coast line, exactly $64\frac{1}{2}$ miles from Brisbane. The district is known as the Blackall Range, and, except to a few merchants, residents, and Government officials, it is a complete *terra incognita*, and the general public are far better informed on matters affecting Croydon, Thursday Island, and other distant Northern localities than they are with the rural life, the production, interchange, and social condition generally of the inhabitants of the Blackall Range. Yet the traveller passing on the train which climbs and winds in a sinuous course round the range and its numerous steep spurs, beholds much of the grand scrub land through which the line passes. He also observes neat little townships nestling in the cleared scrub. Such are Landsborough, Palmwoods, Woombye, Mooloolah, Yandina, which latter has good water communication to the sea by the Maroochy River, navigable for many miles from its mouth for fairly large river steamers, and for boats laden with produce almost to the railway bridge at Yandina.

From these townships roads, if one may dignify by such a name the timber-waggon tracks, with deep ruts and gullies, which in wet weather are impassable for wheeled traffic, lead up to the top of the range, across deep chasms, and along steep and precipitous sidelings. On the more level country there are some pretty clearings and neat farms, where the farmers cultivate principally sugar and fruit.

We will, however, take Nambour as our starting point, as leading to the more accessible parts of an apparently inaccessible range. The township is prettily laid out, and possesses two very good hotels, the Royal Hotel being the largest, close to the railway station. The accommodation is excellent, and quite equal in domestic comfort to good hotels in the city. There are several large stores, where all the necessaries of life may be procured. But the chief glory and mainstay of the town is the fine Central Sugar Mill, replete with most modern appliances for sugar-making. (Fig. 1.) All the land around the town which has been cleared—and there are several hundreds of acres so dealt with—has been planted with sugar-cane, which is delivered to the mill by tramways running in different directions. (Fig. 4.) These tramlines are on the 2-foot gauge. At present the trucks are drawn by horses, but it is intended eventually to run locomotives, for which such a gauge in such broken country is very suitable.

To give as good an idea as possible of the country through which, thanks to the courtesy of Mr. Lunn, manager of the mill, and Mr. Mackenzie, the engineer of the line, we were enabled to travel, we will give as copious a *résumé* of our notes on the district as space will allow.

Mounting a trolley which had been prepared as a passenger carriage for the State Premier when he last visited Nambour, we travelled fairly smoothly along the line, whose curves were not of that most exquisite symmetry described as the line of beauty, some being rather angular than curvilinear, a matter, however, of small importance with horses as the motive power and the speed less than 5 miles an hour. (Fig. 2.) The horse, by the way, requires neither reins nor leader, but trots along the narrow track between the rails without once making a mistake. The trolley, of course, is controlled by a powerful brake.

The line passes through very fertile land, where the sugar-cane, both plants and ratoons, was looking very healthy, and gave promise of heavy crops next season. Much of this land is leased by kanakas. (Fig. 3.) When the kanaka does nothing on the land, but employs white men to do the work, he is entitled to claim the sugar rebate, just as would a white lessee. We very soon left this level country and got amongst the hills, where some very heavy work had been done in the way of deep cuttings and embankments. (Fig. 2.) One cutting alone, we were told, cost about £2,000. This was about 40 feet, all through solid rock. After this, the line wound round the sides of very steep

Plate II.



VIEWS ON THE BLACKALL RANGE.



hills (Fig. 4), running on the verge of deep gorges. This portion of the line reminds the traveller of the Cairns line to Kuranda, only on a smaller scale. The scenery—including hills, gorges, precipices, watercourses, and scrubs—is almost identical with that on the Northern line. There are no looplines, consequently, when we met a “rake” (five or six trollies coupled together) (Fig. 5) coming down loaded with sugar-cane, we had to jump off and upset our trolley on to the bank to allow the train to pass. (Fig. 6.) On those parts of the line following the contour of the hills this would be impossible, as the trolley would fall about 500 feet. As soon as engine-power is substituted, looplines will follow. Large quantities of cane for fodder were daily coming down the line for transmission by rail (Fig. 5) to the Brisbane market, and the cane-farmers realised more for their attenuated crops than they could have done had the cane gone to the mill. These trucks, although small, are substantially built of hardwood, the axles and wheels “made in Germany.” They each carry 3 tons, and when loaded at the hill farms run down the line by themselves, controlled of course by a couple of steady brakemen, on a grade of 1 in 18 and 1 in 20. Sometimes, owing to the fact that familiarity with danger breeds contempt, a few trucks have been allowed to get out of hand, and the consequence has been that they got off the rails at a curve and capsized; but accidents are very rare, as the men in charge are chosen for their steadiness. On the down trip the five horses which haul the empty rake up the range trot down by themselves behind the loaded train, and are only needed to haul it along the last half-mile or so of level before reaching the mill. The animals are wonderfully trained, and nothing seems to disturb their equanimity.

The last half-mile of the line was laid by Mr. A. R. Mackenzie (Figs. 6 and 6A.) It is certainly the most formidable section of the present track. Instead of passing through deep cuttings or (as was proposed) through two expensive tunnels, the hills were contoured and only side cuttings, rarely exceeding 4 or 5 feet, were made, the off-side looking down upon deep gorges and the line winding like a snake round the spurs. It is this portion which gives the striking resemblance to the Cairns line. When the next $1\frac{1}{2}$ miles to the top of the range are completed, a consummation devoutly wished for by all the farmers in that part of the district, the resemblance will be even more remarkable. On reaching the railhead we left the trucks and stood at the foot of “Highworth,” a large, cleared cane farm belonging to Mr. F. Murtagh (Fig. 6A.) A glance at the illustration will give an idea of the height and steepness of this place. Three bunya-trees alone stand (one has since been felled) to denote that the spot was once covered with the tall dense scrub which is visible on all sides. The slope up which we were invited to walk to reach the top of the range, although, of course, far from perpendicular, was so very steep as to necessitate a few halts to admire the scenery. The distance is only 400 yards, and the surveyed line for the continuation of the tramline winds about in the form of the letter S, enabling a line to be constructed with its steepest gradient 1 in 25, and its least 1 in 30 in a distance of $1\frac{1}{2}$ miles.

Mr. Murtagh, who is one of the directors of the Nambour Sugar Mill, has generously given all the land needed for the line. “Cut the farm up into gullies and embankments, if you like,” he said, “but give us the line.”

He owns about 600 acres of splendid land on the range, mostly hilly, and has 32 acres under cane—all on land far too steep to enable him to use even the lightest horse implements, as shown in the illustration. Still, the land is of the richest, and produces splendid cane crops. When the stumps have disappeared, the whole will be put under grass for grazing. This will prevent, to a large extent, what must inevitably happen during heavy wet weather—viz., the washing down of the soil into the valley below. New land is being cleared for future cane crops (Fig. 7). Two stout No. 4 wire lines are stretched from the summit to the railhead below. These wires are 450 yards long, and are stretched taut by a windlass below. The cane is made up into bundles of from 1 to 2 cwt., is hooked on to the wire, and goes flying down to the trucks (Fig. 6A). One man can send down 14 tons a day.

Mr. Murtagh has three fine sons who help him on the farm, and who will by-and-by farm each a portion of the land on his own account. Such young men and others whom we met form the backbone of a community.

Passing out at the back of this farm we still had a little higher to go, and about half-a-mile away obtained a splendid view of the ocean at the mouth of the Maroochy River. Below us lay a fertile, well-cultivated valley covered with fine crops of sugar-cane, maize, potatoes, bananas, &c.

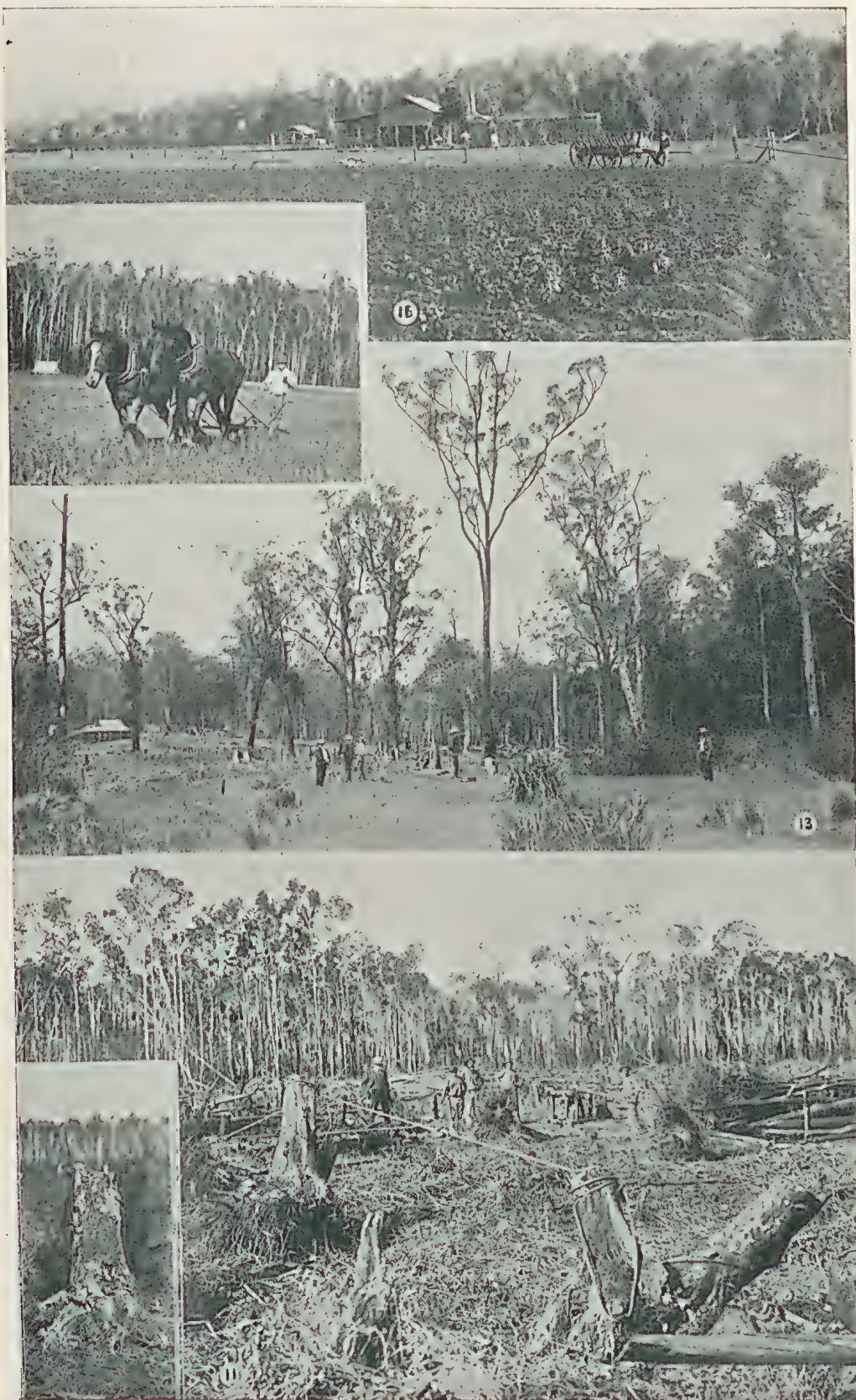
In this valley there are about 300 acres under crop, and much more scrub was felled and being burnt off. It is in the occupation of twenty-one families of Russian Finns, and their settlement is appropriately named Finnbury (Fig. 8). The children attend the provisional school and are very apt at learning to speak, read, and write English, whilst few of the parents can even speak English. A tramline from the Nambour Mill runs right through all their farms.

On the other side of the ridge, right from the roadside, stretch some of the most beautiful farms, on gently-sloping land, that the eye could dwell on. The land is of the richest description of deep, virgin scrub soil. The stumps have all disappeared, and horses and up-to-date implements are everywhere seen (Fig. 9). Sugar-cane and other crops were in a very forward state, looking green and healthy. The great trouble with these tableland farmers, as they may well be called, is that they have no roads by which they can profitably convey their produce to market. Their cane was mostly sent down the wire on Mr. F. Murtagh's farm. All along the ridge the road is almost level, but to get to Nambour 6 or 8 miles of terribly steep road have to be negotiated. An empty dray is a heavy load for one horse to bring up. If the building of the tramline is proceeded with it will change the entire outlook and cane will be planted there in large areas.

We learn that 3,630 acres of this land are now held by forty-four *bonâ fide* farmers, some of whose names are here given. Amongst the owners, who number nearly fifty families, are Messrs. Doig, J. and F. M. Murtagh, Don, Allen, J. and J. W. Smith, Guy and Walter Petrie, Dalziell (five families), English, Phillips, Wright, Whitecross, Bennett, Bruhn, Pope, Volker, O'Gorman, Lambert, Adams, Mackay, Henderson, Ewart, Ohlsen, Benfer (three), Bradshaw, Park, Phillips, McCullough, &c. Their average holdings range from 60 to 80 acres each, every inch of it excellent land, available for sugar or any other crop. At present there are about 450 acres planted with cane and being got ready for more, and it was stated that if the tramline came to them, and was carried over the level country thence to Dulong, the area under cane would be increased threefold. The average yield of cane has been from 30 to 40 tons per acre, and sixth ratoons gave 30 tons. Thus, from 30,000 to 50,000 tons of cane would go from this plateau alone to the Nambour mill. All the farmers here are within a couple of miles of Dulong.

We will leave this part of the district for the present and take a run to Petrie's Creek, a few miles south of Nambour. We started in a rather ancient wagonette, and had got along pretty well for two or three miles over some particularly rough road, when one of the hind wheels suddenly collapsed, and the machine came to a standstill (Fig. 10). Fortunately the horses did the same. A dray was borrowed from a neighbouring farmer, who at the time was planting cane on newly burnt off land (Fig. 10A), and our artist's paraphernalia having been transhipped, we made a fresh start, intending to go as far as Bli-Bli, on the Maroochy River, but meeting a farmer, Mr. R. Nichol, we decided, at his invitation, to inspect his and his brother's farms, and had no cause to regret our decision (Fig. 10B). After taking our lunch on the bank of the creek, the artist, Mr. Mobsby, took several photographs, amongst which was a very interesting one of a method of extracting green stumps by means of a sort of windlass and blocks and wire-rope tackle, an apparatus which can be obtained for £12 (Fig. 11).

The side roots of the stumps are cut, the tackle fixed, and one young fellow heaving the windlass easily hauled two large green ti-tree stumps clean



FARMS ON PETRIE'S CREEK, BLI BLI.

Plate IV.



out of the ground. Mr. Thomas, the inventor of the machine, with his three sons, was completing a contract for stumping a ti-tree swamp at £13 per acre for Mr. Charles Nichol, and the last anchor stump is here shown on Fig. 11. It may sound strange to Brisbane River and Downs farmers, this expensive clearing of a ti-tree swamp for farming purposes. By the way, the felling of the trees and burning them cost an additional £2 5s. per acre. There are, however, swamps which are not swamps. The growth of ti-tree was very dense. The soil beneath was covered with ferns, and in very wet weather retained little water. The land was quite level and not raised in knots and clumps of mud like the swamps of the lower Brisbane. As to the soil, it was a rich, strong, sandy loam, about 4 feet deep, without a suspicion of sourness in it. As soon as a portion of the land was cleared, it was ploughed, harrowed, and cross-ploughed, and planted at once with potatoes. These were being hilled up at the time of our visit and promised to yield a good crop. The experiment was an expensive as well as a hazardous one, but the result is all that could be wished. A much larger portion of the ti-tree land will be cleared this season. On one portion of it cabbage seed was sown broadcast and was coming up well.

From the cultivation ground on the bank of the creek through the ti-tree to the foot of the rising ground, an extensive drain 37 chains long has been cut, 5 feet wide at the top and averaging 5 feet deep. This has a good fall to the river and will serve to keep the whole of the so-called swamp dry in wet weather. A peculiar formation is noticed here. Throughout the whole length of the drain there are regular strata of sea-sand below, then rich soil; next, a layer of ashes; then rich soil again with a second layer of ashes. Large logs were taken from the bottom of the drain, showing that the soil has been gradually making until, after the lapse of a long series of years (hundreds probably), the depth has reached 4 feet.

The brothers Nichol, of whom there are three, have worked very hard to bring their farms, which all adjoin, to their present fine state of cultivation. A photograph taken by our artist of some of the newly-cleared land on Mr. C. Nichol's "Rosedale Farm" will show how heavy the labour has been (Figs. 12 and 12A).

The cane crops are looking remarkably well; and, generally, all other crops are thriving. Mr. Simmons, a neighbouring farmer, has tile-drained his farm at a cost of £12 per acre (Fig. 10B). The drains are placed 7 yards apart. This is an enterprise which will serve to show the faith these farmers have in the future of agriculture on Petrie's Creek. They have spent some £2,000 on improving their land, trusting that, eventually, the tramline, which has already been advanced a considerable distance down the Creek, will pass their farms on its way to deep water on the Maroochy River. This extension could be made for about £2,000, as it is all level country, as may be seen by a reference to the illustrations showing the direction it would take (Fig. 13).

On the way back we visited Mr. R. Nichol's "Norfolk" farm, and also took views on the place. Messrs. Nichol's father, a hale old gentleman of 89 years of age, was working in the field hay-raking at the time of our visit. An interesting group of three generations was taken by our artist (Fig. 13A.)

Mr. C. Nichol told us that if the tramway were completed quite 1,000 acres of cane would be planted on Petrie's Creek within two years.

Having concluded our interesting visit to this portion of the creek, we returned to our dray and reached the broken-down wagonette about dusk. There was just light enough to effect some repairs. We suggested supplying the derelict with a wooden leg. Accordingly a stout sapling about 8 feet long was passed under the axle and over the brake bar, and lashed securely to both. The wheelless side thus rode on the trailing sapling. The horses were hitched up, the broken wheel taken on board, and then Mr. Lunn drove the vehicle safely back to Nambour. Some rude persons remarked that we had returned too late for the comfort of a flock of hens which had nowhere to roost that night.

After this first trip to Petrie's Creek, we made an excursion to Dulong and Mapleton on horseback, Mr. Mackenzie going ahead in a light buggy with the

photographic instruments, &c. We have ridden over a good many bad, hilly roads in Queensland, but this road takes precedence as the very worst and most impracticable road for the conveyance of farmers' produce, not excepting the old Sea View Range road in the North. The divisional board had a stiff problem before them to make any road at all up the range, so that, considering all circumstances, they did good work in this connection, although doubtless, when it was completed, easier gradients presented themselves which were previously unsuspected. Such things will happen in all newly exploited districts, and it is very comforting to have a divisional board to rail at when a dray laden with 4 cwt. of goods and drawn by two strong horses fails to reach the top without unloading. Even our light buggy, with a powerful willing draught horse and a light driver, proved too much for the animal on some parts of the road. To bring produce profitably to market by such a road is a sheer impossibility, and we heard of one man who actually burned 70 acres of good sugarcane for this reason. He had depended on the tramline coming up, and planted this large area, which would have brought him a handsome cheque had he been able to get it to the mill. There were several others in like unfortunate cases.

The distance to the top of the range from Nambour is about 6 miles. This distance we covered in a little over two hours on horseback, and then found an almost level road, with here and there a slope and rise, as far as Dulong. Along nearly the whole route, some 2 miles, there was magnificent scrub land, alternated with grand timber country, carrying hundreds of flooded gums of great size, height, and symmetry, intermixed with tallow trees and bloodwood, all of great girth and height to the first branches.

Descending a slight ridge, we came to a culvert crossing the head waters of the Maroochy River, commencing here in a mere waterhole.

The terminus of the proposed tramline is in the vicinity of this spot. Now we rode up a very long steep incline, bordered on both sides with splendid forest timber, and, arriving at the top, found ourselves at Mapleton Post and Telegraph Station, situated on a beautiful stretch of level country on the road to Obi Obi. Here there are one or two farmers' houses and a provisional school conducted by Miss Fitzgerald. There are some sixty-eight children on the roll.

We only made a short halt here, and then continued our journey for a couple of miles, always through rich land covered with dense scrub, until we reached some very pretty, artistically-built cottages with pretty gardens in front and several acres of fine, healthy-looking orange trees, the oldest trees being seven years old. These handsome orchards are the property of the Messrs. Smith, father and son. It needs only a look at the trees to arrive at the conclusion that the soil is most admirably suited for fruit culture. Plums and other fruits are also grown, and at the time of our visit all the trees were loaded with fruit and blossoms, the orange trees especially having such a heavy crop that some method of thinning the fruit of the larger trees would have to be adopted. Bananas are no longer largely grown, as it was found that the fruit, if picked in a nearly ripe stage, would not stand the long trip on pack-horses to Nambour, and if picked green would not pay to take to market. Mr. Smith, senr., told us that last year he sold 208 cases of oranges, gathered from thirty-nine trees, young and old (none over seven years old), at an average of 9s. per case. Besides this, he gave away several cases to friends. His son sold navel oranges at 14s. per case. All this fruit was sent away on pack-horses, the roads being too steep to allow of anything like a load being sent by dray or wagon. Judging by the appearance of the crop now coming on, these figures will probably be doubled next season, twenty cases per tree being anticipated. There is no disease of any kind on the trees so far. Noxious weeds also have not yet made their appearance in the orchards.

It seems a pity that the bananas should be cut out, as they bear heavily in this district—as many as thirty dozen on a bunch.

Pineapples thrive admirably here as, indeed, do all fruits and vegetables which have been grown in the district. Strawberries are also sent away in quantities on packhorses, and stand the jolting very well, being securely packed in small boxes to avoid shaking. In the event of the tramline being carried to Dulong, it would stop at a point some distance from Mapleton, but it still would be a great boon to the farmers and fruitgrowers, as they could take a full load down the long incline from the Razorback to the terminus, and only the empty vehicles would go up the hill.

About a quarter of a mile from Mr. Smith's house there is a tremendous gorge 500 or 600 feet deep, having a perpendicular face as if it had been a wall of masonry. A waterfall, during wet weather, hurls itself down this terrible precipice. It bears the name of the Baroon Fall. The water, however, was not running in the creek above the falls when we saw it. The gorge stretches out into the far distance between the scrubclad mountains.

In conversation with Mr. Smith and other residents, we got an idea of the enormous difficulties and obstacles encountered by them on settling in these wild fastnesses. None but timber-getters could have been the pioneers, for what man would travel through dense scrubs, up and down precipitous mountains, in the hope of discovering rich farming land? Mr. Smith told us that the only way of getting stores to his farm was to travel on foot to the far-distant mouth of the Maroochy River, visible from where we stood at the falls. The entire distance of over 10 miles was through a dense, trackless, hilly scrub, through which a passage was effected by the help of the axe. Many a time he had gone to the Maroochy, at Pettigrew's sawmill, to await the arrival of the little steamer from Brisbane. Sometimes she did not arrive on her due date nor for days after it. Then the farmers camped among the mangroves on the beach; sometimes tramped all the weary way back, to make a second and a third journey. When the stores did arrive, a bag of flour had to be divided into four loads of 50 lb. each, and on occasions flour has been left on the beach until the first supply was exhausted and another journey had to be made. Equally severe was the journey which some made over the hills to Palmwoods and Woombye. When Horace penned the lines—

*Illi robur et aes triplex
Circa pectus erat, qui fragilem truci
Commisit pelago ratem.* . . .

which, being interpreted, signifies: Oak and triple brass must have surrounded his heart who first entrusted a frail bark to the rough sea—he had no conception of the indomitable courage and stout-heartedness which were the attributes of the men who braved the solitudes of the mountains, the dangers from natives, who suffered often hunger, constant privation, and the thousand and one discomforts, and the accidents and possible sickness inseparable from this lonely life. And what shall be said of the brave women who followed their husbands and fathers, and did their share, and are still doing their share, of the work of opening up the finest lands on this continent for the benefit of those who, coming after them, can do so in comfort by train, tram, and road? It is such men and women as these who have added a wealthy continent to the British Empire. Yet they ask for no reward, no medals, no monuments. All they ask is, "Help us to get our produce to market. Bridge over our two or three miles of impassable road for us, and we will do the rest."

However, this is a digression. We shall consider the question of communication further on.

Leaving Mr. Smith's house, we made our way back to Mapleton Post Office, and enjoyed a very nice afternoon tea, kindly offered by Mr. Rosser. The return journey to Nambour was safely made down the range.

It had been arranged that we should go to Bli-Bli at 6 a.m. on the following day, but owing to some misunderstanding the conveyance which was to have taken us there had not arrived at 10 a.m., so Mr. Lunn kindly provided a trolley and horse, and we started for the range to make a more complete inspection of the tramline, and to take views from several points of interest,

especially along the tram route. This occupied the best part of the day, and on our return we were met by Mr. Keil, the oldest resident of Bli-Bli, who had brought in his cart and horses at midday.

As we had plenty of work to do to occupy the rest of the day, we decided to defer the Bli-Bli expedition until next morning, when we got an early start, and were safely driven by Mr. Keil over the bad, hilly roads to his hospitable house on a grassy hill overlooking the Maroochy River (Fig. 14). We called on a farmer, Mr. James Wright, living some distance up the river, and he at once let us have his boat, which we pulled down to Mr. Keil's wharf ready for an early start in the morning. Before going, however, we looked over the farm, which is in a good state of cultivation. Papaw trees thrive well here, and several trees were laden with fruit; corn, potatoes, and other farm vegetables were growing well. Mr. Wright has about 700 coffee trees in bearing, and is about to plant out some hundreds more. The trees vary from three to six years old, and bear very well. The crop was then being picked. The coffee sells, in the parchment, at 6d. per lb. in the neighbourhood. The fruit is pulped on a home-made machine, which does its work in a fairly satisfactory manner; but, as the trees come into full bearing and more are planted, proper pulping and hulling machinery will be obtained. Mr. Mobsby took some views of the cultivation before we left.

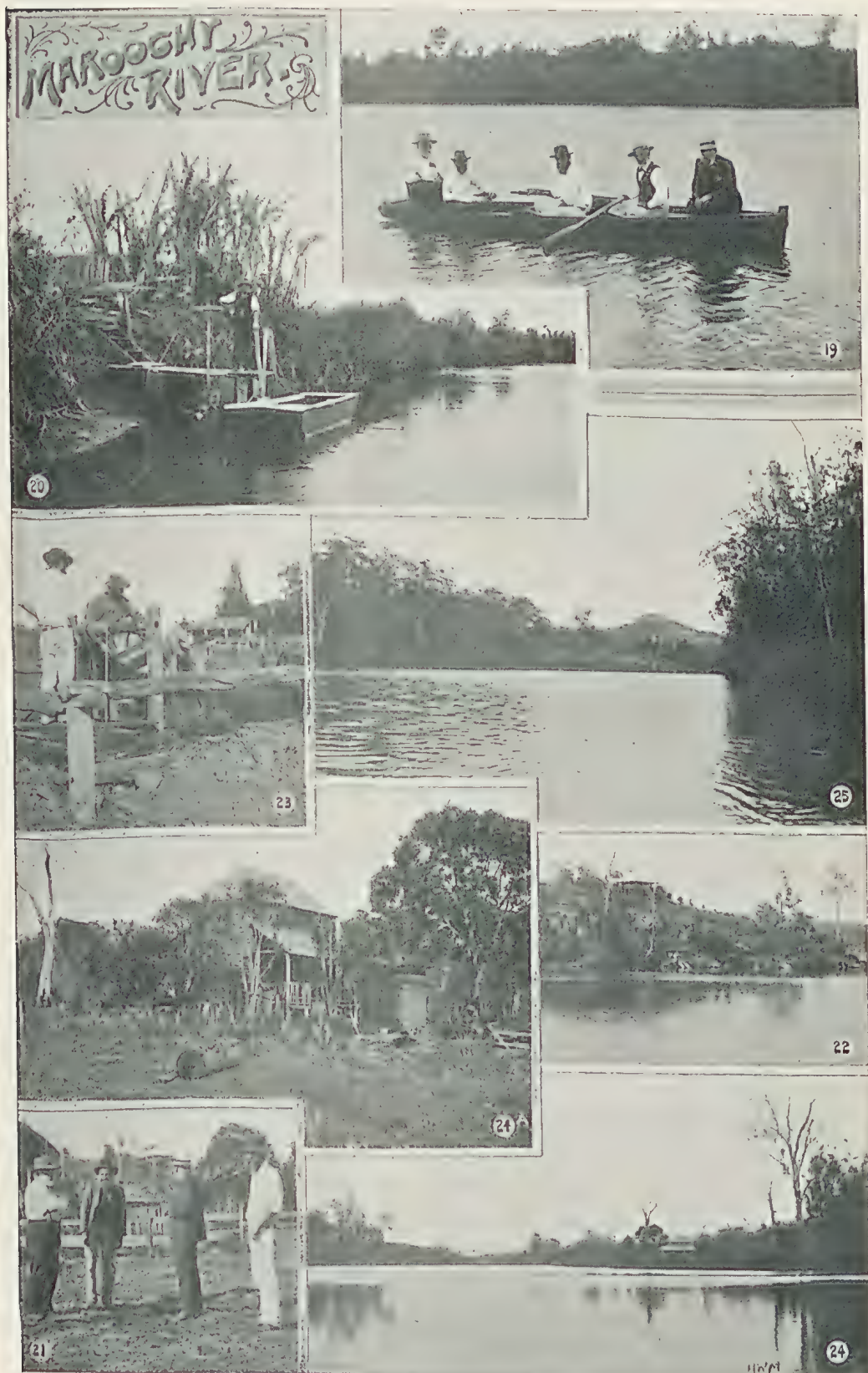
After dinner we walked over to the farms of our old friends, the Nichols. As stated, these are all adjoining (except Mr. J. Nichol's, Nixierville Farm, which is close to Mr. Keil's house). They are named respectively—Rosedale, Reachview, and Norfolk farms (Figs. 15 and 16). We spent the rest of the day (Sunday) in getting information as to all that had been done to get the farms (all originally heavy scrub) into their present high state of cultivation. Some photographs here reproduced will show what heavy work had to be done after felling and burning off to get rid of the stumps and set the plough to work.

I may here mention that this portion of the Maroochy River is famous for its oysters—such oysters as one rarely sees in Brisbane shops. The beds are rented by a gentleman in Brisbane, and are looked after by Mr. Histed, who sternly refuses to sell or give away any of his employer's property in the shape of bivalves (Fig. 18). Still he allowed us to taste some at his house, and, like Oliver Twist, we asked for more.

It was arranged that we should be up next morning at 3 a.m., so as to catch the tide to carry us up the river for about 12 or 14 miles, Mr. Chas. Nichol and Mr. Wright kindly consenting to accompany us to assist in pulling the boat.

Accordingly, we had a very early breakfast, and with a fine moonlight began our trip up this fine river (Fig. 19). We decided to stop only when the tide failed us, and to call on the river farmers on our return.

Shortly after leaving Bli-Bli the banks of the river on both sides are clothed in dense scrub, or rather what would have been dense scrub had not the most disastrous bush fire ever known to white men in Queensland swept through the scrub and destroyed it for several miles (Fig. 17). So fierce was this fire, fanned by a gale of wind, that thousands of trees were killed, including huge flooded gum and other trees which grow in or on the edge of the scrubs. For three weeks after the fire the sound of falling trees was heard. Whilst it raged, the sun and moon were obscured, volumes of smoke poured into the houses, semi-darkness, only relieved by the glare of the fires, reigned for several days. One settler was completely burnt out of house and home, not even clothes being saved (Fig. 20). So marvellous, however, is the recuperative power of the rich alluvial soil that already a new scrub was growing up to take the place of the destroyed timber. It may also be noted here that when farms had been cleared and abandoned, the scrub has grown up, and, but for some stumps remaining, it would appear as if the original scrub had never felt the axe of man. In some places, on forest land, a secondary growth of young flooded gums had grown up. These would rejoice the heart of a German



VIEWS ON THE MAROOCHY RIVER,

forester. The saplings range from 3 inches to 1 foot in diameter, and rise to a height of 40 or 50 and more feet, as straight as gun barrels, and growing as closely together as cabbages. There is one beautiful grove of these young trees just below Mr. Keil's house, and other groves further up the river. Some day these will be cut down and burnt!

We only called at one place on our way up the river, promising to look in again on our return. The tide favoured us for about 14 miles, which brought us to the splendid farm belonging to Mr. Manthey, a German farmer of the good old stamp who made the Rosewood scrub, the Albert and Logan River scrubs, to blossom into thriving settlements (Fig. 21). He and his sons have cleared a very large farm, and have planted all kinds of crops, including sugar-cane, oranges, &c., which thrive splendidly in the deep, rich, alluvial soil, always subject to floods, and consequently never losing its grand fertility. Mr. Manthey has built a very pretty house on an eminence on the other side of the river, where the flood does not trouble him, and has surrounded it with a pretty garden of fruit trees. He has named the place "Dunduthen," at least that is as near as we could get to the spelling of the name, which is a native one (Fig. 22).

Here, again, we were confronted with the question of the tramline. If that were brought down Petrie's Creek to deep water on the Maroochy River, he would not hesitate to put in 100 acres of cane, and punt it down to the tram wharf, punts being provided, of course, by the mill. One hundred acres of cane on land like this would mean about 4,000 tons, or over 500 tons of sugar, the produce of one farm alone.

There is plenty of good fresh water to be got on these lands at a depth of from 20 to 50 feet, and Mr. Manthey, who milks a number of cows, has an ample supply in his wells for all stock in the place (Fig. 23). At one well we found in the stuff taken from the excavation seashells, and a piece of wood covered with barnacles, showing that the land was once below the sea-level.

After bidding farewell to this worthy farmer, we saw on the other bank of the river, lower down, a pagoda-like residence of two stories (Figs. 24 and 24A). We ran the boat to the wharf, and were warmly greeted by an ex-student of the Queensland Agricultural College, Mr. Dyne, who, it will be remembered, won the champion prize at the ploughing match at Gatton for youths under 18. Mr. Dyne and his brother have only been on their selection for four months, but they have done a good deal in that time, and have a crop of corn looking well, grown from Argentine seed. They are having a pretty rough time of it getting the farm into order. Like most of the land here, it is all subject to flood, but the upper story of the pagoda affords a safe retreat, and there is no rush of water to do any damage. We looked over the place, and after a pannikin of very good coffee, we started down stream for the next place—a farm belonging to an old gentleman named Covington. He and his wife suffered severe losses in consequence of the bush fire I have already described (Fig. 20). The river here is about 200 yards wide, yet burning tea-tree bark blew across, landed on the roof of their house, and, in spite of all endeavours to extinguish the flames, the house and all the surrounding buildings, trees, &c., were destroyed, not a thing being saved. Yet the brave old gentleman and his plucky wife are hard at work getting in a fresh crop, and, as he said, if only the tramline were at the river, he would have a crop of cane in, and soon pull out of his great troubles.

After taking a view of Mr. Covington's place, we continued down the stream till we reached Mr. W. Burton's farm. This gentleman was very emphatic on the subject of growing cane. Some years ago a person—I need not give his name here, but all Maroochy and Petrie's Creek people know it—announced his intention of building a large sugar-mill on the river. He put in the posts of the shed, and the farmers, taking his *bona fides* for granted, put in a large quantity of cane. The mill was not built, the farmers lost their money and labour, and now Mr. Burton says: "We were 'had,' but we have learned wisdom. Without a tramline and punts not a cane do we put in. People will

plant cane if they can get it to the mill at Nambour. At present it is impossible. Make it possible for us, and cane will not be wanting." To get the river cane or other produce to Nambour, they must either take it in boats 18 miles up the river to Yandina, and waste a lot of time there in hunting up a horse and dray to carry it to the railway station, or they must let it rot on the farm. It is estimated that, given facilities to get the cane to the mill at Nambour, there are 6,000 acres of rich land on either side of the river, which would rapidly be put under cane. At present only about 150 acres would be planted if the above facilities were at hand, but 600 acres would go in in the following season.

We need say little more about this matter; suffice it, that the Maroochy is a deep, wide, navigable tidal river almost up to Yandina (Fig. 25). It runs in its serpentine course through the richest of agricultural lands, where also there is scarcely any limit to the supplies of splendid timbers for building or fencing purposes. But owing to the want of roads it is cut off practically from communication with the North Coast railway line, and its fertile lands for the most part lie in their primeval state, or where cleared have, in many cases, been abandoned for no other reason but the one named—no facilities for sending produce to market. Still, people have not lost faith in the future of the district. A considerable amount of clearing is being done, and all the newly-cleared land will certainly be planted with cane when canepunts run in connection with the tramlines.

On the following day we visited Mr. D. Currie's orchard, Boondara, where the trees, especially the young ones, are looking very healthy, most of them being in blossom. There is a proved coal seam on this property; indeed, payable coal underlies a large portion of the Nambour district. There is, undoubtedly, a great future before this part of the Blackall Range. It possesses even more resources than many of the Northern agricultural districts, and has a great advantage over the latter in being within a few hours' journey from Brisbane, whilst it may also be reached by small coasting steamers which, on a draught of 5 or 6 feet, can proceed many miles up the river.

HINTS FOR YOUNG FARMERS.

By THE EDITOR.

WHEAT-GROWING.

One of the most important crops in all countries of the world is wheat. Wherever the climatic conditions are suited to it, there wheat is grown by the bulk of farmers. It is the great necessary of life, as bread is called the "staff of life," and it is of the utmost importance that every country should produce, if not everything which it requires in the way of agricultural produce, at least its own supply of wheat. England does not do so, and she is therefore dependent upon supplies from her colonies and from foreign countries, which supplies may, in time of war, be considerably curtailed and possibly entirely cut off. The total quantity of wheat grown in the world reaches 2,500,000,000 bushels, of which Great Britain produces about 80,000,000 bushels, Australasia 52,000,000, Canada 68,000,000, India 248,000,000, Argentine 80,000,000, the United States of America 696,000,000, France 360,000,000, Russia 352,000,000, Germany 112,000,000. Queensland, with a population under 500,000, produced last year (1901), in round numbers, 1,500,000 bushels, or about 3 bushels per head of the population, equal to only three-eighths of the annual requirements per head, which is about 8 bushels, so that our need for home consumption amounts to about 4,000,000 bushels. The area suitable for wheat-growing in this State is very extended. So far as is at present known, that area is included in the country extending from Hughenden in Lat. 21 degrees S., Long. 144 degrees E. to the New South Wales border in Lat. 29 degrees S., and thence to the Main Range and northwards to a point beyond Nebo. Roughly then the wheat country may be said to cover 108,000 square miles. Wherever wheat has been

tried within this area it has proved successful. The limited rainfall in some portions of the Central Western districts is a drawback in certain seasons, but on the whole, given close settlement, such as we have on the Darling Downs, this State could become one of the premier grain-producing countries of the world. I will now say something about the

CULTIVATION OF WHEAT.

We have to-day arrived at the point in our farming operations when the old haphazard methods of cultivation have given place to more scientific work. First of all, we no longer sow large areas on imperfectly prepared ground, we make use, where needed, of artificial manures, we keep farm stock, and we do not disregard the rotation of crops. For several years the State farms have devoted their best energies to the production of the best kinds of wheats, combining good milling qualities with heavy grain and freedom from rust. Such selected wheats have now been generally distributed amongst the farmers, with the result that in such seasons as that of 1901, yields of 30, 40, and 50 bushels of grain have been harvested. The importance of depth in the matter of ploughing is now well understood, and yet all farmers are not agreed as to what is the right depth to ensure a good wheat crop. Everyone knows that for all crops a deep, loose, soil is productive of better results than where shallow ploughing is in vogue. As I said before, some parts of the State are deficient at times in sufficient rainfall. It stands then to reason that where such is the case deep ploughing should be the rule, because where the seedbed is deep and loose much moisture will penetrate the soil, which moisture may, to a large extent, be retained there for a lengthened period by judicious cultivation. With a good subsoil, 6 inches is a reasonable depth for wheat, and every season this depth may be slightly increased without damaging the field by bringing much of the subsoil to the surface. The land should be prepared in January or February to allow time for the soil to get into good condition by seed-time. There are two methods of sowing—broadcasting in the old style, and the modern method of drilling in the seed by machinery. The latter plan is by far the best in every way. It is more economical in the matter of seed, it distributes the seed evenly and at a uniform depth, and the wheat grows in separate rows, which gives free play to the air, and consequently is beneficial to the plants in making them healthy and strong.

As for the quantity of seed to sow per acre, this varies so much with climate and conditions that it would scarcely be wise in me to lay down a hard-and-fast rule on this point. Several factors have to be considered, such as the character of the soil, and of the variety of wheat grown, its habit of growth or tillering habit, the cleanness of the soil, the climate and rainfall, the use or otherwise of machinery.

In broad-casting, from 1 bushel to $1\frac{1}{4}$ bushels are usually required, whereas by the use of the seeddrill only one-quarter of that quantity is required. If wheat be sown for hay, then $1\frac{1}{4}$ bushels per acre is not too much, whilst oats would require from 2 to $2\frac{1}{2}$ bushels and barley $1\frac{1}{4}$ to $1\frac{1}{2}$ bushels per acre.

Much depends upon the choice of seed. Seed wheat, taken from a cold climate to a warmer locality, will, if sown under certain conditions required for it to hold its own, develop and mature a crop much quicker the first year than seed saved where the growing season is twice as long. In the selection of pedigree or crossbred wheats for seed, the attention of the cultivator should be confined to such descriptions or varieties as will, with proper care, reach the highest limit of quality where they are to grow. To adopt any wheat on outward appearance is very ill-advised, unless the precaution has first been taken of ascertaining whether that wheat is hardy, and whether the straw is long enough to carry the ear without bending, and, besides this, the class of soil and climate it has been used to. The virtue of crossbred or pedigree wheat resides in the almost invisible germ, and is an impress from consecutive generations. There is another matter for the farmer to consider—namely, that of the necessary nourishment for the young plant. It is a remarkable fact that the miller requires the exact composition of the grain that the wheat plant

requires for its proper food, and it should be borne in mind that these special wheats, by careless growing and cultivation for two or three years, will make a rapid reversion and become thin and wretched.

As for the varieties best suited to our Queensland soils and climates, the best varieties of hard wheats for April sowing are Belatourka, Budd's Early, White Lammas, Purple Straw, Talavera, Allora Spring, Marshall's No. 3, Ward's Prolific, &c.; whilst for late sowing—that is, during May, June, and July—the spring wheats may be sown, such as Budd's Early, Improved Allora Spring, Marshall's No. 3, and Farrer's hybrids. The earliest of wheats is the Japanese, grown on the experiment plots at the Hermitage State Farm. This variety is earlier even than Allora Spring, and gives an immense yield. The grain is hard and full of gluten. It is perfectly rust-resistant, having been grown alongside wheats which showed rust very strongly whilst it remained clean.

Having chosen the seed, the next thing is to treat it chemically to prevent the occurrence of smut and bunt.

These are two different fungoid diseases, although one is generally mistaken for the other. Smut attacks wheat, oats, barley, rye, and some grasses. It appears in June or July, when certain ears of wheat are seen to be covered with a dark powder. Examination shows that the floral organs and their coverings are destroyed and replaced by a mass of dark, chocolate-coloured powder, consisting of innumerable spores. These spores are blown away before harvest time, and many of them settle on the healthy grains and remain there till seed-time, when the disease is again produced. The result of smut in grain is a greatly diminished yield.

Bunt attacks wheat and barley, but seldom oats and rye. Its effects are only seen at harvest time, when it is seen that apparently healthy ears contain only grain filled with a greasy, foul-smelling mass of black spores. The only outward difference in the appearance of the grain is that the affected grain is plumper and generally darker in colour than the healthy grain. The presence of bunted grains in a sample of wheat deteriorates the quality, as it blackens the whole bulk, and the flour from such can only be used for inferior purposes. Both bunt and smut are reproduced year after year by the very minute spores adhering to the grains, and these grow along with the seed when it is sown.

Now these spores must be destroyed before the seed is sown. This is done in two ways—namely, by steeping the seed in a pickle of sulphate of copper (bluestone), and by treating it with hot water.

The mode of pickling or steeping seed with copper sulphate is as follows:—The solution is mixed at the rate of 1 lb. of copper sulphate dissolved in 1 gallon of water. This will steep 4 bushels of wheat. The grain is then spread out on a smooth floor, and the solution poured over it. It is then turned over once or twice with a shovel, and left spread out thinly until sufficiently dry to sow. Another way is to put the seed in a basket or bag, and plunge it into the vessel containing the solution, taking care that the immersion is long enough to ensure every grain being wetted. The contents of the bag may then be emptied onto a dripping table, by which the superfluous fluid is drained off into a vessel beneath. Seed treated in this manner may be kept for a considerable time if it is not convenient to sow it at once.

THE HOT-WATER TREATMENT

requires a furnace or some other heating apparatus and two boilers, one holding water heated to 120 degrees Fahr., the water in the other to 135 degrees. A smaller vessel containing boiling water and an abundant supply of cold water should be within easy reach. Put the seed wheat into a loose gunny bag or a well-perforated kerosene tin for small quantities. Plunge the vessel, which should not be quite full of grain, into the first boiler containing water at 120 degrees. Move the sack or tin about in it for a minute or two till the grain has all been warmed by contact with the water. Then plunge it into the boiler containing the water heated to 135 degrees. Allow it to remain in this for

ten minutes, agitating the grain the whole time. If the temperature falls, keep it up to not less than 132 degrees by adding boiling water. At the expiration of ten minutes, plunge the seed into cold water and then spread out to dry, after which it is ready for sowing. This plan is cheap and effective, and is of great use when bluestone is not available. It has also this advantage over the bluestone treatment—less seed is destroyed. Whatever precautions you take with bluestone, its corroding action is certain to be fatal to the germinating powers of more or less of the seed to which it is applied.

The seed wheat having been duly dressed, it is sown as soon as dry with the seed drill. If manure is required, it can be sown at the same time as the seed. When the seed is sown, one harrowing will be sufficient; if sown broadcast, two harrowings are required. As soon as the wheat is a few inches above ground it should be rolled, a process which consolidates the soil, and wheat thrives best in a firm soil, and rolling prevents "lodging." Should the growth be too rank, eating it down by a flock of sheep will remedy the trouble. Sometimes this has to be done twice in this State. The next thing to be careful of is to see that the fields are kept clean.

Weeds are the great trouble of the wheat crops, and especially is the wild oat a bad weed. I have seen fields of which it could not be said what crop had been sown. I remember a few years ago asking a farmer whether a certain field contained oats or wheat, and his amusing reply was to the effect that if oats were dear that season it would be an oat crop, but if wheat were dear then he would call it a wheat crop.

Some farmers go to considerable trouble to prevent the wild oats from getting onto the land. This they do, as is done on the State farms, by procuring perfectly clean seed, and as the crop grows they go through it regularly right up to harvest time, pulling out every "stranger" which shows its head. Others are so careless that they let wheat, oats, and charlock all grow together. Then when they cannot get the same price for their wheat as their more careful neighbours, they wonder why it is, and think the buyer is trying to drive a hard bargain. Wheat should be cut soon after the upper portion of the straw turns yellow, which will be about a fortnight before the grain is quite ripe. The grains are then heaviest, and contain the largest proportions of starch and gluten for grinding into flour. If wheat be allowed to stand until it is "dead ripe," some of the starch clings to the woody fibre, thereby giving the grain a thicker skin. It is, in that state, a better protected seed certainly; but it is less suitable for the miller, who likes a grain which contains the largest proportion of flour and the least proportion of bran. The crop having been cut, say with the reaper and binder, it is gathered up and placed in stooks in the field. Some farmers "cap" the stooks, but most of them say that it is almost useless trouble, as the first high wind blows off the capping sheaves.

The next most important work is

STACKING THE WHEAT.

Several little matters in connection with the stackyard are often overlooked when once the harvest is finished and work presses in another direction. Too much care cannot be bestowed upon the proper building of the stack. One thing which demands particular attention is to see that the butt ends of the sheaves are not placed higher than the ears. Nothing could be worse than this, for the sheaves sloping inward conduct the rain into the stack instead of down the roof, and thus much harm is done. The middle of the stack should be well filled in, and a false roof formed before finally finishing off.

Stacks may be built oblong or round. For large crops the oblong is the best, as one large stack is better than many small ones, as there is less exposure and less loss. The slovenly way in which some farmers in the State build the things they call stacks should at once be abandoned.

In commencing the stack, it is best to lay down a foundation of slabs, and begin the work by forming a stook or cone in the centre, and keep the sheaf gradually inclining downwards towards the outside of the stack, with the ends

directed outwards. The middle should always be kept full and *higher than the outside*. If this rule be adhered to, there will be no danger of the rain penetrating, as it will be carried off by the straw without doing any damage.

The builder must do the work on his knees, and his assistant should place each sheaf within easy reach to enable him to pack the sheaves as closely as possible. In the absence of the carter, the builder should be on the ground beating in the ends of any sheaves which may be projecting, as, by paying strict attention to this matter, the rick can be kept as perpendicular as the walls of a house. The assistant should keep the stack well tramped down. The height of a rick to the eave should not exceed 10 feet—8 is better. When this height is reached, and to form the eave, one row of sheaves should be allowed to project about 3 inches, after which the builder should begin to draw in each row of sheaves slightly, so as to form a pitch similar to that of a pitched roof, until the rick has narrowed to the width of a sheaf on top. If the rick is to be held over for a long period, I would certainly advise thatching.

It frequently happens that the stacks cannot be finished off in consequence of nightfall, or because of going to cart in some other crop; in such a case the middle should always be left well filled in and a cloth put over it if there is a likelihood of rain.

The best manure for wheat is a mixture of nitrogenous and phosphatic manures. On fertile soils, nitrogenous manures should not be used alone, because they have a tendency to encourage a luxuriant, grassy growth instead of a large yield of grain, and this will be the case more particularly in a wet season. By using superphosphate in conjunction with nitrate, this trouble is reduced, and it is still more minimised by the use of salt.

Many of the mineral substances in the soil are rendered soluble by salt. Such are the phosphates; thus they enable the plant to come to maturity sooner than would otherwise be the case. Nitrogenous manures are beneficial when the formation of the upward axis and leaf has commenced, and it is also said that at the time of flowering and fructification nitrogenous manure is advisable, but this is as yet doubtful.

The rich lands of this State, however, require no manure for many years; in fact, it is necessary to plant other crops for several seasons before placing them under wheat, which would otherwise grow too rank, to the detriment of the grain crop. After a first crop of wheat, the land may be cropped with that cereal for fifteen or twenty years before the yield per acre noticeably decreases. I give here an example confirming this statement. The Red River Valley in Minnesota is a wheat-producing district of the United States of America, and many analyses have there been made of old wheat soils and adjacent virgin soils. In the instance I quote, which is one of many, two soils were selected, No. 1 being an uncultivated virgin prairie soil and No. 2 from an adjoining field which had produced ten successive crops of wheat, two crops of flax having been taken off before the wheat-cropping was begun.

The chemical composition of these soils is given in the following table:—

				No. 1. Virgin Soil.	No. 2. After Ten Years' Wheat Culture.
				Per Cent.	Per Cent.
Insoluble matter	...	...	...	47.64	55.12
Silica soluble in Na_2O , Cl_3	...	...	...	15.43	16.92
Potash	...	...	...	.54	.50
Soda	...	...	...	.45	.41
Lime	...	...	...	2.44	2.40
Magnesia	...	...	...	1.85	1.91
Ferrie oxide	...	...	...	4.18	4.20
Alumina	...	...	...	7.89	8.81
Phosphoric acid	...	...	...	.38	.31
Sulphuric acid	...	...	...	.11	.10
Carbonic acid	...	...	...	2.42	2.45
Volatile matter	...	...	...	15.55	5.85

Before cultivation the soil contained over 12,000 lb. per acre to the depth of 1 foot of both phosphoric acid and potash. Since a heavy wheat crop removes less than 50 lb. of potash, and 40 lb. of phosphoric acid per acre, the ten wheat crops have removed less than 4 per cent. of the total amount originally present in the soil.

Now, as 96 per cent. of the mineral elements remain in the soil after ten years' cropping, any decline in wheat-producing power is not due to loss of these elements. This decline must be looked for in oxidation, bacterial action, and burning off the stubble.

Here is a table of the organic constituents of the two soils:—

	No. 1. Virgin Soil.	No. 2. Long-cultivated Soil.
Volatile matter (including organic)...	15.55	5.58
Humus	5.34	3.12
Total nitrogen ... ..	.38	.24
Total phosphoric acid in humus ...	25.03	4.97

So we see that the ten years' cultivation has resulted in very little difference in the mineral constituents of the soil, but in 14 per cent. of nitrogen, or nearly 37 per cent. of the amount originally present. A similar loss of humus has occurred. The most serious is the loss of nitrogen. If that loss were to continue at the same rate, in twenty-five years the whole of it would be gone. But, fortunately, this heavy rate of loss does not continue for long. The heaviest loss is in new soils. As they get older the rate of loss is materially less. Still, the annual loss of nitrogen has been about 450 lb. per acre, and, as a wheat crop only removes less than 50 lb., the remainder is lost in other ways, as mentioned above. After ten years' cropping with wheat, the weight of soil changed from 61 lb. to 85 lb. per cubic foot, due to loss or shrinkage of organic matter.

Now, a proper rotation will once more raise the yield. Whilst the yield, by continuous cropping, at last fell to 8.9 bushels, the intervention of a crop of clover raised the next season's yield to 22.3 bushels. Thus we have here two facts showing that when wheat is grown in a rotation of which clover forms a part, a large gain in yield of grain is the result, and also that, as that yield can be increased on an old wheatfield by simply a change in the method of culture, the soil is not depleted of its mineral fertility.

When wheat is raised in a rotation it is not an exhausting crop; but when raised continuously large amounts of nitrogen are lost, not through the crop, but by the decomposition of the nitrogenous humus.

The fact that the wheat soils "recuperate" so easily when given the right culture, and that the loss of nitrogen can be checked and even increased by a rotation of crops, makes the outlook for our oldest wheat farmers even better than it has been up to the present.

Where wheat land is very poor in certain necessary constituents, the following artificials and stimulants may be employed with advantage:—(a.) Phosphatic manure alone, about 2 cwt. per acre. The chief phosphatic manures are bonedust, superphosphates (bone or mineral), basic slag, and phosphatic guano. (b.) For land deficient in nitrogen: (1) $1\frac{1}{2}$ cwt. to $1\frac{3}{4}$ cwt. super., and $\frac{1}{2}$ cwt. to 1 cwt. sulphate of ammonia; (2) 2 cwt. basic slag and $\frac{1}{2}$ cwt. to $\frac{3}{4}$ cwt. nitrate of soda; (3) $1\frac{1}{2}$ cwt. to 2 cwt. bonedust, and $\frac{1}{2}$ cwt. to $\frac{3}{4}$ cwt. nitrate of soda or sulphate of ammonia. Sour land may require quicklime, also light sand; apply this in dressings of 2 tons or thereabouts per acre. Occasionally light lands may also require potash, and the mixture might be some such as $1\frac{1}{2}$ cwt. super. or bonedust, $\frac{1}{2}$ cwt. to $\frac{3}{4}$ cwt. sulphate of ammonia, and 3 cwt. wood ashes or $1\frac{1}{2}$ cwt. kainit. Lighter or heavier dressings may be made according to condition of the land.

POTATO CULTIVATION,

Amongst the products of the soil of the greatest value to mankind must be reckoned the potato, sometimes called the English or Irish potato. As a matter of fact, the potato is neither. It came originally from America, and hence would be better named were it called the American potato. So universally esteemed is this tuber that it is cultivated in large quantities in every part of the world where the soil and climate are adapted to its growth.

In Australasia and New Zealand it has an extended range, and is one of the staple farm crops for home use and for export. In Queensland the potato may be successfully grown all along the south-eastern seaboard as far north as Mackay, and inland west of the Main Range it is largely cultivated.

In the industrial world it is much employed for the production of starch, of which the tubers contain about 18 per cent. It is propagated by means of the small tubers or by cuttings of the larger ones. It may also be reproduced from the seed, which is contained in a green, acid fruit, under the name of potato apples, on the upper stem or haulm of the plant. Farmers, however, never grow that crop from the seed. This practice is left to experimentalists.

The most suitable soil for potato-growing is a rich, deep, sandy loam, containing a large amount of humus, which helps in the retention of moisture, and the production of certain fertilisers suitable to the plant. Such soils may be found in every part of this State, both on the coast and inland, and although they do not yield such enormous crops as the fertilised lands of the South-eastern States, Tasmania, and New Zealand, still the crop is a most remunerative one. Queensland has, moreover, the great advantage of being able to produce two crops annually, a winter and a summer crop, equally prolific.

Heavy clay soils are not suitable for potatoes unless they have been thoroughly drained, manured, and worked to a friable condition. They are also colder than sandier soils, and hence the crop takes longer to come to maturity. Much may be done in even very sandy soils to secure a crop by the help of manures, irrigation, and good cultivation.

As the potato is a tuber which expands rapidly underground, it stands to reason that deep tillage is necessary, and whereas with many crops the surface soil only is reduced to a fine tilth, with the potato it is imperative to success that the whole depth of the tilth should be fine and loose.

Deep and thorough cultivation is a paramount necessity in order to ensure a heavy crop of large tubers. I have never failed to impress on you that, preparatory to planting a crop, the land should be ploughed at such a time as will allow of its remaining exposed to wind, rain, sun, and frost for a considerable time. This will disintegrate and sweeten the soil, and also allow it to take up in its entire body whatever fertilising elements may be introduced by showers of rain. The best way to attain this object is to throw the land up in rough ridges, and to leave it in that state until the time comes for the proper preparation of the seedbed. Should, however, a very dry season come on at this time harm may result from the rapid drying out of the soil. In such a case it is well to harrow down the ridges at two or three successive operations. This will have the effect of preserving much of the moisture in the soil. In breaking up new land, or old land with a growth of short grass or weeds on it, turn the sod well under, burying all the growth. This will then have a chance to decay and form the valuable constituent humus so beneficial to every soil.

For the winter crop, potatoes are sown in this State from February to the middle of March. Therefore give yourself plenty of time in January to harrow down your rough ridges. Then cross-plough, following this up with the harrows. In fact, to use homely language, knock the soil about, with plough, harrow, and cultivator, till you have a fine tilth to a depth of 8 inches.

Now you will be ready to plant.

THE SELECTION OF SEED

is a most important point. There are many varieties of excellent potatoes which will bear heavy crops in one district, but almost fail in another. As

a rule it is not advisable to try what I call "fancy varieties." Like fancy breeds of fowls, they are all very well for exhibition purposes, but for a large field crop they are usually disappointing. Flukes, Snowflakes, and Kidney potatoes were never successful with me, except in small patches cultivated as garden products. Circular Heads (Blueskins), Brownell's Beauty, and Suffolk Champion are proved sorts, being especially suited to the Darling Downs climate and soil. Kidney potatoes require a fine black loam or sandy soil to suit them. The Early Rose is a good variety for the Darling Downs, as it suits most soils, and ripens at the same time as Suffolk Champion. As to the size of seed, there are many different opinions as to what is the proper size. Potato seed, no larger than marbles, has been known to produce a heavy yield of large-sized tubers; but to ensure a crop from such small seed, the land must be rich and new.

For a winter crop, my experience has been that whole potatoes, about 2 inches in diameter, give the best results; and for the summer crop, the cut setts are the best. When the seed potatoes have been cut, they should not be planted at once. The cut surface should be allowed time to dry. Many dust the seed with soot or ashes. This hardens the cut face, and they are thus to some extent protected from rotting after planting, should wet weather come on.

In order to induce the seed to sprout, the best plan is to keep the potatoes in bags. I have spread them out and covered them with hay, and have also kept them in pits, but bagging always proved the best plan. There are people who plant their potatoes whether they have sprouted or not, but no one who is experienced in potato-growing would think of planting unsprouted seed. At the Queensland Agricultural College a quantity of seed was kept on the floor of a barn, and covered with straw until the planting season came round. They were then carefully sorted, and all which had not sprouted were placed in a separate heap. About two weeks previously a farmer had planted a quantity of unsprouted seed. When, at last, the latter appeared above ground as a straggling crop, showing a very large percentage of misses, the former were already fit for hilling up, and there was scarcely one miss per acre.

Sometimes when seed potatoes have sprouted badly in the damp or elsewhere, the shoots are rubbed off, and this undoubtedly tends to weaken them. Still, one or two trials in such a case have been of a decidedly reassuring character. In one case three potatoes were taken which had sprouts all over them, so that there seemed to be no eye left unshot. The sprouts were all pulled off, and the potatoes were planted in a box, where they sent up vigorous shoots. A more severe test was made. A potato was taken with five eyes all shot out, the shoots were broken off, and each eye was cut out with a small piece of tuber around and under it. The eyes were then planted, and all five sent up at least two shoots to each eye. It is surprising what a number of sets can be cut out of a potato by care.

If you take an average potato, weighing from 6 to 10 oz., you will find that it has from twelve to eighteen eyes, which, if cut into single eyes, would give as many sets, which would naturally produce a more even sample of young tubers than the same number of whole sets of odds and ends that have been considered not large or good enough for cooking.

When whole potatoes are planted, two or three eyes start into growth first, and these keep the lead of the others during the whole growing season, and from their stolons the largest potatoes are produced. But when single eyes are planted the whole strength of the set is devoted to one growth, all the young tubers are formed at the same time, and as the plant has no other calls on it for nutriment these continue to grow and form large tubers. In experiments made in England by the late Professor Lindley it was shown that whilst the whole tubers yielded 338 lb. of potatoes per perch, the single eyes produced 1,367 lb.; 1 lb. of tubers cut into forty-three sets yielded 3 bushels

5 gallons per perch. The above experiment was also made by myself a year or two ago with similar results. The yield may also be expressed thus:—

Whole tuber ...	...	...	...	2
Single eyes ...	...	...	...	11
Three eyes ...	...	...	...	5
Potato parings ...	...	...	...	4

That is to say, that where the whole tuber produced 2 lb., the single eyes produced 11 lb.; three eyes gave 5 lb., and potato peelings 4 lb. It is a remarkable fact that by using potato peelings and protecting the plants from frost, new potatoes may be produced all the year round, of course only to a limited extent in the kitchen garden.

So much for the seed. This having been duly prepared and the land being ready for planting, cart your bags of seed on to the ground and deposit them at intervals of 5 chains along the rows which have now to be drawn. With a light plough run the seed furrows at a distance of about 27 inches apart to a depth of 5 or 6 inches.

Here I must say something about planting on the flat and on the ridge. Either method depends on the soil and climate. If your land is light and the rainfall moderate, then plant on the flat. The reason for this is that the sun and wind will have less surface to act upon and, consequently, evaporation of moisture will be less. But if your soil is heavy and only slightly porous and the rainfall is great, then the ridge system should be adopted, for the very obvious reason that the excess of water runs off the ridges into the furrows and so is conveyed away from the level of the tubers, which otherwise would suffer from a superabundance of moisture. And here it may be noted, that where there is a heavy rainfall the rows may be closer together and the ridges consequently higher, or rather sharper, and the rainwater will run off the more quickly. Where the rainfall is scant the rows should be further apart, and the ridges, if the ridge plan is adopted, will be flatter, and so give a greater catchment to rain and dew, whose moisture is conveyed to the roots. Under such circumstances 30 or even 36 inches is not too great a distance apart in the rows. There is another advantage in having wide rows. You can work your horse implements between them for a considerable time, until, indeed, the weeds have no longer a bad influence on the crop.

As to the distance between the sets, that depends upon the nature of the growth of the plant. Twelve to 14 inches between sets is considered a good distance—12 inches as a minimum and 14 inches for strong growers. When the potatoes are deposited in the furrow, turn the soil over the sets with a harrow, or, if using a plough, the furrows should be turned over to such a depth that the sets will be covered to a depth of 5 or 6 inches. A lighter covering than this is not advisable, as the sun's rays are very powerful, and any exposure to them is detrimental to the quality and appearance of the potato, because the new tubers form above the plant set and not below it, so that there must be a sufficient covering of earth to protect the tubers as they swell.

The ground being planted, run the harrow along the direction of the furrows. Then, if your ground is clear, nothing further need be done until the haulms appear above ground, when a light one-horse harrow should be run over them. This stimulates their growth, and destroys any weeds which may have taken root. It also will save a good deal of hand-hoe work, which, however, cannot be avoided before the potatoes are ready to hill. The next business is to send the horse hoe or scarifier between the rows to loosen the surface and clear the weeds. The more work you do between the rows, and in them with scuffler and hand hoe, the more certain you may be that a good crop will repay your labour—given, of course, fair seasons. But even in dry weather you should keep the surface soft and pliable, for thus evaporation is retarded. Once the tubers are formed on the roots, be very careful to avoid deep cultivation. Do not disturb the soil to a greater depth than 2 inches at the outside, for the obvious reason that you will, by going deeper, injure the tubers.

Now, I will suppose that you have adopted the ridging system. In this case, draw the drills from 3 to 5 inches deep, and when you have planted your potatoes as before described, the ridges should be split and the soil thrown back with a mould board plough. If drilled back, it is a good plan to reduce the ridges, say a week after planting, either with a saddle-backed harrow or an ordinary harrow, running in the same direction as the drills, and it is sometimes of advantage to give a run over crosswise, but the strokes should be very light from a light set of implements or from an ordinary harrow, having its teeth set slanting backwards, so that the soil shall not be disturbed more than 3 inches deep at the most. These operations will reduce the drills somewhat and loosen the surface of the soil, at the same time checking any weeds which may attempt to grow.

Now you may horse-hoe, scuffle, and hand weed until the tops are about 8 inches high, when they are ready for moulding up. When this operation is completed all cultivation ceases and you must depend on the favour of the seasons for the rest.

Moulding up gives fresh plant food to the roots, it also protects the swelling tuber from the sun, and furnishes a means for drawing away superfluous water. Never mould up when the earth is sodden with wet. If you do so there will be a hard, baked mass of earth pressing on the haulms, and this cannot be remedied easily. Again, potatoes should not be earthed up in exceedingly dry weather, for then a large surface is exposed to drying winds and sun, and this is liable to check the growth of the young tubers. If possible, strike the happy medium between wet and dry. All you can do in protracted dry weather is to keep the surface lightly stirred, and when any slight shower comes, earth up with the horse hoe so set that it will raise the soil to the ridges, and then when a good rainfall comes earth up properly as soon as the soil is in a condition to allow you to do so.

Reverting to the question of seed. A change of seed is always desirable. You may once in a way exchange with a neighbour whose soil is quite different from yours; but, as a rule, it is best to get a change from a country where soil, climate, and seed are quite different from what obtains with your district. You may improve your crop in another way—that is, by changing from one soil to a soil of a different character if you have such a difference of soil on your farm. Change from a red to a black, from a sandy loam to a heavier chocolate. You may also rotate your crop by following corn or wheat or clover or lucerne with the potato crop. A potato crop following the ploughing up of an old lucerne field is almost sure to be a success. Again, say you plant new land with potatoes. Take off a summer and a winter crop. Then plant corn, and follow this up with oats. Let the land then lie fallow for a time. Afterwards plough down the weeds, then by-and-by give a good ploughing, top-dress with manure, and plough the manure in. This will give you a result, when you plant potatoes, which will far more than compensate for the labour involved.

This rotation system will have the effect of keeping down insect pests owing to the absence of their particular food.

In the matter of manures, farmyard manure is an ideal one for potatoes. It is not so much on account of its special fertilising qualities as for its mechanical effect on the soil. It warms the land, opens it up, renders it friable, enables it to retain moisture, and fulfils all the conditions which the potato specially demands. It is always well to supplement farmyard manure with some artificial manure. I give here a mixture which is considered the best manure for potatoes.

Eight tons of farmyard manure and 3 cwt. of nitrate of soda or an equivalent quantity of sulphate of ammonia.

Any artificial dressing for potatoes (if stable manure is unavailable) should contain nitrogen, phosphorus, and potash. Omit one of these and the result is a poor crop. The omission of nitrogen will cause the greatest loss, and that of potash the least.

An 8-ton crop of potatoes taken from 1 acre of land removes from the soil 90 lb. of potash, 8 lb. of soda, 5 lb. of lime, 7 lb. of magnesia, 34 lb. of sulphuric acid, 20 lb. of phosphoric acid, and 10 lb. of hydrochloric acid—in all, 17 $\frac{1}{4}$ lb. of inorganic matter. This for the tubers alone. Allow an equal quantity for the haulms, and the quantity taken from the soil is doubled.

It is therefore evident that to grow potatoes in perfection the foregoing constituent elements must be present in the soil.

The best method of applying artificials is to apply phosphatic and potash manures some time before planting in the proportion of about 150 lb. to the acre. At the time of planting, sow nitrate of soda in the drills at the rate of 1 cwt. per acre, and at earthing-up time apply from $\frac{1}{2}$ to $\frac{3}{4}$ cwt. Farmyard manure is good, provided it has been properly fermented and is well decomposed; but there is nothing more fatal to good results with potatoes than putting fresh manure and potato sets together. I know this from my own experience. I planted a field of potatoes, placing the sets in furrows on stable manure. The haulms grew luxuriantly (when the plants grew at all); but as for potatoes, there were none.

The potato is a surface feeder, and requires its food in a form which it can readily assimilate. Hence the following mixture, added to 8 or 10 tons of farmyard manure, is as good as the one previously given:—

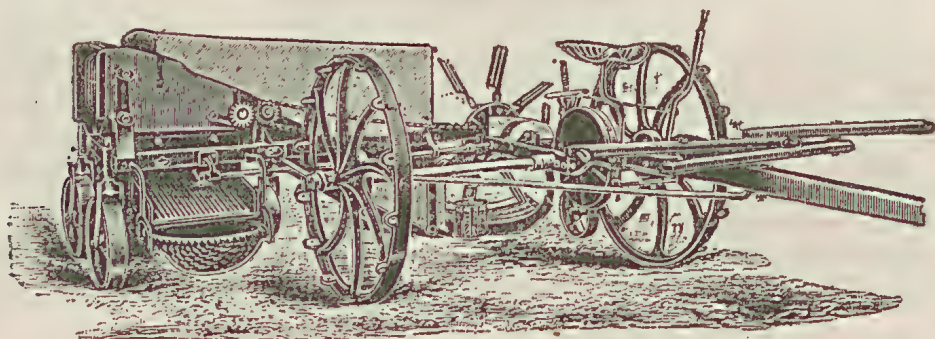
	lb.
Superphosphate	280
Sulphate of ammonia	125
Sulphate of potash	115

This represents about 9.5 per cent. of phosphoric acid, 5 per cent. of nitrogen, and 11.5 per cent. of potash. The cost of this in this State would be about £2 5s.

All the ingredients may be mixed together. Instead of sulphate of potash, 115 lb., you may use 500 lb. of kainit, worth £1, but it is a bulky manure and may have a bad effect on the tubers. It will do no harm if it is applied to a crop preceding potatoes, but at all events the sulphate is better.

The crop having come to maturity, we will consider the digging, grading, storing, and marketing. How may you tell when the crop is ripe? If the tops have all dried off and the skin of the tuber is not easily removed by rubbing with the thumb and finger, the crop is ready to dig. In the old colonial days, potatoes were dug by means of a long-handled shovel, and a man had to work hard to turn out and bag 1 ton of marketable potatoes in a long day's work. The digging fork was slower, and it had the disadvantage of injuring many potatoes by the prongs passing through them.

Next, the crop was turned out by means of the plough, which was a great improvement, but it left many tubers buried. Then several kinds of patent diggers were introduced. One was a sort of plough with a grid instead of a share and mould board. This split the ridge and threw the tubers to either side on the surface. In the old country, much use is made of an invention which not only digs but gathers and grades the tubers, filling them into hampers which are attached to the machine, as shown in the illustration herewith:—



Only two men are required to work the machine. The potatoes are raised in the usual way, but a grid is placed behind the share, which prevents the potatoes from falling to the ground. As the forks revolve, the potatoes are thrown on to the elevator, which is continually travelling upwards. The potatoes, haulms, and weeds are carried forward onto a second elevator which has wide divisions. The potatoes fall through these on to a riddle below, the large ones being delivered into a hamper on one side of the machine, and the smaller ones, falling through the top part of the riddle, are deposited in a hamper on the other side. Thus the small and large are effectively separated. The weeds and haulms are carried over the top of the second elevator and fall in a row on the ground in rear of the machine. All the extra hands usually required to gather up the potatoes as they are scattered on the ground are dispensed with, and thus a considerable saving is effected.

Now, a word about storing potatoes, as you may wish to hold your crop for a higher market. There are several ways of doing so. Some place the potatoes in heaps, cover them with dry grass and weeds, and put 5 or 6 inches of earth over this. Such a plan is not to be recommended, as the covering is too air-tight, giving rise to fermentation and, as a consequence, to decay. Still the potatoes must be covered to keep them in good condition. They may be heaped on the barn floor or on a dry well-drained portion of the farm, and covered with hay, straw, or long grass. Like sweet potatoes, the tubers must be dry before being heaped and covered, or, if they are not quite dry, as soon as they begin to sweat open up the heap, sort them over, removing all damaged potatoes, and heap them up again in another place.

Amongst the latest of new farm appliances is a new potato planter, which English farmers speak of in high praise. The implement is remarkable for its simplicity. The accompanying diagram shows at a glance the principle of it:—



Under the old system of hand-planting, 1 acre a day is hard work for a man. This planter, called the "Jervis Potato Planter," enables a man to easily plant 2 acres per day. Emerson says: "There would be more tillers of the soil if the work could be brought breast-high"; and this is just what this implement effects. All stooping is done away with. The labourer stands upright, and proceeds at walking pace. Three potatoes are taken at a time from a hopper slung over the shoulder, and are dropped into the three pipes of the planter. It takes them accurately, and the seed is deposited with equal accuracy. The hopper is hollowed in the side to fit the body, so that it does not sway with the motion of walking. The inventor of this simple apparatus, when giving it a trial before a number of farmers, set seven rows of seed at the

rate of an acre in three hours and twenty minutes. This was when a cart was used. When planting from sacks on the ground, an acre was covered in four hours. The implement is so simple that any farmer can make it for himself out of a sheet of flat galvanised iron.

MANURING.

Should it be found necessary to apply manure to the land, and farmyard manure is not procurable in sufficient quantities, take note of the following hints as to the application of artificial fertilisers:—4 cwt. to 5 cwt. of wood ashes and from 3 cwt. to 5 cwt. of superphosphate or bonedust will give good results. These should not be mixed long before application; indeed, it is better to apply them separately; 4 cwt. to 5 cwt. wood ashes with 3 cwt. of bonedust and 1 cwt. nitrate of soda make a substantial dressing for Queensland practice, although it is light compared with practice in older countries. Farmyard manure may be applied at the rate of 20 tons per acre; but 10 tons per acre, with the addition of $1\frac{1}{2}$ cwt. sulphate of ammonia, 6 cwt. of superphosphate, and 2 cwt. sulphate of potash, will give better results. Muriate of potash is said to produce waxy potatoes.

ONIONS.

The time is now approaching for preparing the ground for an onion crop, and therefore we will now give directions for sowing the seed and for the after-cultivation of this most valuable vegetable.

VARIETIES TO GROW.

The best kinds of onions to grow here are the Brown Spanish, Yellow Globe, and James' Keeping, the former being especially favoured, owing to their good keeping qualities and hardiness.

THE SOIL.

The very best kind of soil for onions is a rich, sandy loam, or good alluvial soil with a fair proportion of sand in it—free, friable, easy to work, a soil that will not cake, and not lying so low as to retain the superabundant moisture after heavy rains. In the latter case the land must be thoroughly well drained. An eastern or south-eastern aspect has been proved to be better than if the land slopes to the west, as the onion does not require intense heat to bring it to perfection.

Having the right soil, see that the seed beds are kept clear of weeds. It is for this reason that we write so early on the subject. The land must be ploughed a long time previous to planting, so that the weeds may germinate, after which they must be destroyed by the cultivator. Then plough the land again, and it will be found to be fairly clean and ready for the crop. Never grow onions on weed-infested ground. If the soil is deficient in humus, dress it heavily with short, well-rotted manure, free from weed seeds: 40 tons to the acre is not too much. If farmyard manure cannot be procured in sufficient quantity, apply in addition ashes, bonedust, &c., because the onion demands the best nourishment and plenty of it. New scrub land is rich enough in natural fertilisers not to require any addition of manure.

PREPARING THE SOIL.

Many people are led into a serious mistake in preparing the soil for planting out onions. They reduce it to a fine tilth, which, of course, is quite right, but they then set the plants in a soil which is loosened to a depth of perhaps 8 inches. No good results can be expected from land prepared in this manner.

It should be remembered that the onion bulb is not the root of the vegetable; it is merely an enlargement of the footstalk, and the true fibrous roots spring from its under surface. This bulbous portion *sits* on the ground, and should not be forced to grow *in* it. The onion requires a firm bed, otherwise the plant, instead of making a large well-shaped bulb, will run to neck, and look more like a leek than an onion. Therefore the soil must be well solidified by rolling.

THE SEED BED.

Onions may be sown broadcast or they may be drilled in, or, again, they may be sown in a seed bed and afterwards planted out in the same manner as cabbages. Each of these systems has its advocates, and as there is a good deal to be said in favour of them we will describe the methods.

First, let us consider the old style of sowing right away in the field. To begin with, be sure that you get good seed. Never buy old seed, because it rapidly loses its germinating power. Much depends on the choice of seed. Four pounds of seed will be required to sow an acre.

In March or April mark out the ground in perfectly straight rows, from 2 to 3 feet apart. Make shallow drills not more than $\frac{1}{2}$ -inch deep. Sow the seed evenly and thinly, rake over the sown drills. Then roll the ground. In sowing broadcast, there is considerable waste of seed, and much hoe work to follow, so we do not recommend the system. But sowing by hand is slow, laborious, and, to some extent, wasteful. Therefore, for a large area, a Planet Junior seed drill should be used, which opens the drill, sows the seed, covers and rolls it, and, at the same time, marks the line for the next drill; 2 lb. of seed per acre are needed for this plan.

The next method is that of growing in a seed bed and planting out. Start the seed in drills a few inches apart. When the plants are 6 inches high, take them up and transplant them into the field, the latter having been previously prepared as directed. When the young plants are taken up, trim them root and top with a sharp knife to make them sturdy, and cover them to develop fresh roots. Then plant them with a dibber about 3 inches apart in the rows. Be careful not to set them too deep in the ground—only just enough to keep them firm. Only the root and about $\frac{1}{4}$ -inch of the bulb should be in the ground. The great advantage gained by planting out is that the plants, being 6 inches high when set out, have a long start of the weeds, and, consequently, are easier to keep clean.

Having planted out the young plants in such a manner as to allow the bulb to squat on the ground, the business of keeping the rows clean begins, and as the onions grow some soil will be thrown up against them in the process. This soil must be always drawn down, so that the root only is in the ground. Where this has not been attended to, the remedy for the resulting want of bulb formation is to wring the necks of the plant, or, at least, to bend them down with a twist. This will have the effect of inducing the formation of bulbs. But, if proper care in cultivating has been taken, this twisting or bending will not be needed.

Large onions are not desirable, the public taste being in favour of medium-sized bulbs, so that closer planting may be adopted.

Onions may be known to be ripe when the tops dry up. When this happens, take them up by hand, and lay them between the rows to dry. Then, with as little bruising as possible, carry them to the barn.

In growing pickling onions, the seed is sown direct into the ground, and very thick—at the rate of 25 lb. to 30 lb. per acre.

The best implement for cleaning onions is a wheel hoe, which can be worked on both sides of a row at once, and will clean the ground to within half-an-inch of the plants on each side. The rest of the work must, of course, be done by hand.

One thing has to be remembered—the weeding has got to be done, and done thoroughly, or your crop will be a failure.

BORE WATER.

Mr. James Cronin, of Brack Hill, Barcaldine, lately sent a sample of the water from his bore to Dr. Maxwell for analysis, and received from him the following gratifying report, which will doubtless be of much interest to our readers in that district:—"I have the honour to forward to you analysis of the water sent down which represents the water that has been used by gentlemen in the irrigation of cereals in your district. I am very pleased to report to you that this water is of excellent quality, being one of the best samples examined in this laboratory. There is not any purpose for which it is not highly suitable. I hope you have plenty of it, and it will pay well to have it applied judiciously to crops in your district. Analysis:—Total solids, 17,465 grains per gallon, '0249 per cent.; mineral solids, 15'050, 0'215 per cent.; organic solids, 2'14, '0034 per cent.; chlorine, 2'8, '0040 per cent.; equivalent to salt, 4'62, '0066 per cent." Mr. Cronin has used this water for irrigating cereal crops for the past ten years with excellent results.

GROWING CAULIFLOWERS IN THE BRISBANE DISTRICT.

By H. HORNIBLOW.

Having been fairly successful in growing cauliflowers in the neighbourhood of Brisbane, I have been asked by a few friends to favour them with my practice and experience. The best time for sowing seed is between the middle of January and the middle of March, as cauliflowers occupy the ground from five to six months, and should be in flower in the coldest weather. The best kind to sow is "Eclipse" or other large Asiatic variety. Seed beds should be cultivated to a depth of not less than 12 inches, being well manured and watered previous to sowing. The best locality for a seed bed is under a fence with an easterly or westerly aspect, so that the sun is not on the bed much more than half the day. Mix the seed with fine ashes, and then scatter over the face of the bed, raking in to a depth of about an inch. Water the bed at once, and cover it with a light layer of fine grass or hay; repeat the watering about every second day, and, when the leaves begin to form, the grass covering may be removed. Cauliflowers do better in virgin soil than elsewhere, provided the ground is well pulverised before to a depth of about 15 inches, and all grass and weeds eradicated. If the soil is poor, a dressing of farmyard manure is necessary beforehand, which should be well dug in. Plants when large enough to remove from the seed bed should be spaced about 3 feet each way, and if at all possible not more than two rows should be grown together, otherwise they got too much shade in the winter months. Frequent watering in dry weather is an essential element to the growth of good cauliflowers, but the day following each watering the surface of the ground must be broken up to admit air. After the plants commence to grow freely in the rows, I have found the best manure to be No. 1 Fertiliser, which can be obtained at a moderate price from any meatworks. My practice is to put a fair sprinkling of this round each plant, but not too close to the stem, then fork in to a depth of 3 or 4 inches, taking care not to disturb the roots. If the plants do not grow freely, a second dressing of fertiliser should be given. Grubs must be searched for daily early in the morning, as even with the greatest care the heart of the young plant will be occasionally found destroyed, and in such case throw it away and put another in. A reserve supply of plants should be set out for that purpose, and can be removed without losing a leaf, if a good clod of soil is taken with them and they are watered at once.

[Watch for the tracks of the Vaginula Slug, so destructive to cabbages and cauliflowers. A ring of tobacco dust round each plant or even round the bed is a certain safeguard.—Ed. *Q.A.J.*]

REPORT ON WORK, QUEENSLAND AGRICULTURAL COLLEGE.
NOVEMBER, 1902.

It is pleasing to be able to report that the dry weather has broken up, and a cheerful aspect is now noticeable in every direction. The College lands look beautiful, and abundance of grass is now available. The cultivated land has also had a good soaking. The rainfall for the month was 3·72 inches for eight days, the principal falls being—11th, 0·35; 22nd, 0·52; 23rd, 0·33; 29th, 2·22.

Farm.—A great deal of cultivating and planting has been carried out during the month. Thirteen acres of lucerne which had been irrigated were cut and converted into hay, giving a weight of 11 tons 11 cwt. of hay. An area of 3 acres of *Paspalum dilatatum* grass was planted in the bull paddock, 5 acres of panicum in the calf paddock, 1 acre of potatoes in experimental plot. We also planted twenty-two varieties of maize and four varieties of sorghum. Plots 3 and 8 (10 acres) were planted with maize. Two double and two single ploughs were kept busy preparing land for planting with the various crops. During the month 36,700 roots of *Paspalum dilatatum* grass were distributed, for which £25 8s. 2d. was received.

Orchard and Garden.—The orchard has had the attention of the Assistant Fruit Expert, who has cyanided some of the trees, and has carried out other necessary work. The orchards and vineyards have been kept well cultivated, and are free from weeds. In the vegetable garden, a large number of different varieties of seed have been planted, and the cultivator kept constantly at work during the period under review.

Dairy.—During the month, 1,061 gallons of milk were converted into butter for a yield of 463 lb. The average number of cows milked daily was 48 head. The increase for the month was as follows:—Ayrshire, 1 female; Shorthorn, 1 male. The cows were fed on green lucerne and lucerne hay.

Pigs.—The increase for the month included:—Berkshires, 12 boars, 13 sows; Tamworths, 3 boars, 2 sows. We sold during the month to Hutton and Co. 13 baconers; and to various buyers, for breeding purposes, 2 Berkshires and 1 Middle Yorkshire boars.

Poultry.—Owing to the dry weather and the scarcity of green feed, the early hatching season was not very successful, consequently most of our chickens are somewhat late; however, since the rain has brought about a spring in the grass they are getting on remarkably well. Records are being kept of the egg production, and some of the breeds are laying well. The incubator is working satisfactorily. It has been necessary to make some experiments with it, as it was found that, owing to the dry weather, the loss of moisture was excessive through there being too much ventilation. By blocking up some of the holes left for ventilation, a great improvement was brought about. Further experiments in this direction are being carried out with the incubator, which is now full.

Apiary.—The bees have not been neglected, about 7 cwt. of honey having been obtained from the small number of hives here at present.

Mechanical Department.—The work in this department has been for the most part routine, including the repairing of implements, shoeing horses, &c. A number of gates have been made and hung.

Dairying.

THE DAIRY HERD.

QUEENSLAND AGRICULTURAL COLLEGE.

RETURNS FROM 1ST TO 30TH NOVEMBER, 1902.

Name of Cow.	Breed.	Date of Calving.	Yield of Milk.	Per cent. Butter Fat, Babcock Test.	Commercial Butter.	Remarks.
			Lb.		Lb.	
Blink ...	Ayrshire ...	28 April 1902	456	3.7	18.89	
Bonny ...	"	15 May "	445	3.6	18.05	
Laura ...	"	12 July "	613	3.8	26.08	
Renown ...	"	21 April "	483	3.8	20.55	
Realm ...	"	17 May "	75	4.0	3.36	Dry, 13-11-02
Ruby ...	"	24 July "	604	3.8	25.7	
Annie Laurie ...	"	10 Aug. "	581	3.6	23.42	
Laverock ...	"	14 Aug. "	712	3.6	28.7	
Lass ...	"	11 July "	525	3.6	21.16	
Lavina ...	"	5 Sept. "	577	3.5	22.61	
Linnett ...	"	10 Sept. "	565	3.6	22.78	
Lottie ...	"	17 June "	427	4.0	19.12	
Lowla ...	"	31 Oct. "	458	3.7	18.97	
Annie ...	"	1 Nov. "	447	3.5	17.52	
Content ...	Jersey ...	8 June, 1901	101	5.2	5.88	Dry, 28-11-02
Ivy ...	"	24 Oct., 1902	573	4.3	27.59	
Connie ...	"	8 Sept., 1901	84	4.7	4.42	Dry, 15-11-02
Jersev Belle ...	"	17 Jan., 1902	93	5.0	5.20	Dry, 15-11-02
Playful ...	"	3 July "	538	4.2	25.30	
Stumpy ...	"	17 Mar. "	494	4.4	24.34	
Sweet ...	"	6 June "	389	4.0	17.42	With first calf
Carrie ...	"	15 Sept. "	540	4.0	24.19	
Damsel ...	Holstein ...	29 July "	561	3.5	21.99	
Mona ...	Holstein Sh'rth'rn	3 June "	566	3.8	24.08	With first calf
Reanie ...	"	7 Mar. "	565	4.0	25.31	With first calf
Night ...	Holstein Devon...	29 April "	388	3.9	16.94	With first calf
Alice ...	Grade Shorthorn	18 Jan., "	390	3.8	16.59	
Catch ...	"	13 Feb. "	108	4.1	4.95	With first calf
Drone ...	"	12 May "	358	3.7	14.83	With first calf
Haze ...	"	11 Feb. "	74	4.0	3.31	Dry, 15-11-02
Lilly ...	"	22 Feb. "	302	3.8	12.85	With first calf
Lemon ...	"	18 June "	483	3.6	19.47	With first calf
Peggie ...	"	19 April "	385	3.6	15.52	
Princess ...	"	5 June "	390	3.9	17.03	
Restless ...	"	16 Mar. "	386	3.6	15.56	
Rowly ...	"	22 April "	417	3.6	16.81	With first calf
Cherry ...	Shorthorn	25 May "	133	3.9	5.80	
May ...	"	26 June "	430	3.7	17.81	
Nestor ...	"	31 July "	665	3.6	26.81	
Plover ...	"	7 Feb. "	96	4.1	4.40	Dry, 15-11-02
Rose ...	"	10 April "	440	4.0	19.71	
Winnie ...	"	17 June "	456	3.6	18.38	With first calf
Guinea ...	"	9 June "	460	3.5	18.03	
Lucy ...	"	14 Aug. "	423	3.5	16.58	
Queenie ...	"	2 Sept. "	545	3.6	21.97	
Kit ...	"	27 Nov. "	41	3.6	16.5	
Fancy ...	South Coast	19 Jan. "	407	4.2	19.14	
Top-y ...	"	4 Oct., 1901	448	3.8	17.94	
Grace ...	"	1 Sept., 1902	552	3.6	21.25	
Double ...	Grade Jersey	9 June "	364	4.0	16.30	With first calf
Brindle ...	"	6 June "	485	3.8	20.64	With first calf
Witch ...	"	13 May "	421	3.6	16.97	With first calf
Lady Rose ...	Guernsey	26 Feb. "	261	5.2	15.31	

The cows were fed on green lucerne and lucerne hay.

BRITISH DAIRY FARMING.

THE PRINCIPLES OF CHEESE-MAKING: PRESSED AND BLUE-VEINED CHEESES.

By JOHN BENSON.

Mr. H. C. Henderson, brother of Mr. J. B. Henderson, Hydraulic Engineer, has sent us the following article on cheese-making which appeared in the *Hamilton Advertiser* (Scotland), and which will doubtless be read with interest by cheese-makers in this State :—

Cheese is that product manufactured from milk into which a large proportion of the solids of milk are gathered together. The solids which are concerned in the manufacture of almost all varieties of cheeses are the casein, the fats, and a large proportion of the ash of milk. The sugar, albumin, one-third of the ash, and a small proportion of the fat are not retained in the cheese, but pass away in the whey.

In all methods of cheese-making the elimination of a large proportion of water of which milk is composed is the chief step in the process. Further, the production of good cheeses depends largely on the quality and cleanliness of the milk used, and on the presence in the milk and curd of certain ferments and moulds which give the particular flavour desired in the variety of cheese manufactured.

In milk the casein exists in a state of suspension, and the first step in securing the separation of the water is in precipitating or rendering the casein insoluble. In cheese-making parlance this precipitation or coagulation of the milk is expressed as "setting" or "curdling" the milk; and the agent almost universally employed in effecting this coagulation is a soluble ferment found in the stomach of young mammalia, and known as rennet. This rennet is chiefly obtained from the stomachs of young calves; on addition to milk—provided the temperature is favourable—the casein takes on a semi-solid form, and in changing its fat encloses in its mass the globules of fat. Rennet fails to act either entirely or partially on milk which has been boiled or on milk possessing a decidedly alkaline reaction. The action of rennet is affected by the temperature and acidity of milk. It acts most quickly at a temperature of about 105 degrees Fahr., but at high temperature there is a great tendency for the fat to separate, and for this reason the coagulation of the milk is usually performed between 80 degrees and 90 degrees Fahr. At temperatures below 75 degrees Fahr., the curd does not get firm, it is tender and difficult to handle, and there is a great loss of fat. An acid condition of the milk within certain limits hastens the action of rennet; but when much free acid (which is able to attack the caseous matter) develops in the milk, the coagulation is granular, and does not possess the properties belonging to a coagulation exclusively formed by rennet.

The action of rennet on milk and curd does not cease with the coagulation of the casein, but is continued throughout the whole period of the making and ripening of the cheese. It acts as a digestive agent, and to a certain extent is responsible for changing the insoluble curd into a soluble and palatable article of food. Omitting the soft and fancy varieties of cheeses, the ripening of which is due to other agencies, it may be taken as a general rule that the greater the amount of rennet used the quicker the ripening process will be accomplished, and this rule holds good in the manufacture of both pressed and blue-veined cheeses.

To make this article more intelligible to the reader and to emphasise the chief variations in the treatment of milk intended for hard and blue-veined cheeses respectively, the principles of the various processes of manufacture, &c., will be dealt with under separate headings.

MILK FOR CHEESE-MAKING.

With all varieties of cheeses, sweet, pure, rich milk is absolutely necessary. It is not permissible to pasteurise milk for cheese-making, as this deteriorates the quality of the produce. Any ill-flavours in or contamination of the milk previous to making into cheese will reappear to a greater extent in the ripe product; hence every care should be taken to have the cows, milkers, utensils, and everything connected with the dairy clean and in perfect order. The best districts for cheese-making are those having soils upon red sandstone or limestone formations, and in which there is more than average rainfall. A good water supply is also necessary. The herbage of the grazing grounds in certain cheese-making districts has an influence on the flavour of the cheese; especially is this so in the Stilton districts of Leicestershire, and in those districts of North Yorkshire where the Wensleydale cheeses are made.

PREPARATION AND RIPENING OF MILK FOR CHEESE-MAKING.

In all methods of cheese-making, to produce good results, the development of lactic acid in the milk or curd at some time during the process is necessary, and just on the period at which acidity is developed depends the ultimate flavour and character of the cheese, and its tendency to develop blue mould in its interior or otherwise. By ripening is meant acidification of the milk or curd, and this ripening takes place usually before the salt is added. Along with other constituents, milk contains a portion of sugar, and this substance is quickly acted upon by certain bacteria which convert the milk sugar into lactic acid. There are also numerous other varieties of bacteria which produce ill-flavours, &c., in cheeses, but we will confine our remarks to those bacteria which are responsible for the proper ripening of milk and curd. Lactic acid plays an important part in the manufacture of cheeses, and may make or mar the whole process.

In the manufacture of pressed cheeses, of which the Cheddar variety is typical, the development of acidity should take place in the milk previous to renneting. Ripening of the milk favours the production of a close, firm texture in the body of the cheese. It assists greatly in expelling the whey, and renders possible the conclusion of the whole process of cheese-making in from six to eight hours. Pressed cheeses—at least those subject to heavy pressure—should not contain more than about 40 per cent. of water when put to press. If there is an excess of moisture in the curd, or the curd be under acid, then there is a tendency in the cheese to ferment when taken to the curing-room, and this fermentation greatly detracts from its value. It is possible to get rid of excess of moisture in pressed cheese curd by mechanical means, but the process is slow, and the results not as a rule satisfactory. On the other hand, milk intended for blue-veined cheeses should be perfectly sweet when the rennet is added. What is required in blue-veined cheeses is to conserve a large percentage of moisture in the curd. Of the three best known varieties of blue-veined cheeses—viz., Stilton, Wensleydale, and Gorgonzola—the Wensleydale only is subject to pressure, and this is only a slight pressure, and does not interfere with the escape of the moisture by drainage from the formed cheese. What is wanted in a newly made cheese of the three varieties named is a soft open body full of interstices, an open coat which will allow the escape of excess moisture, and admit air carrying the spores of the mould responsible for blue-veining of the cheeses. Any ripening or acidity of the milk tends to closeness and tightness of the body of the cheese, and it will readily be understood why Stilton cheeses made from sour milk are hard and gritty, and fail to get blue. Of course acidity is developed, but in the curd; but of this we will treat presently.

TEMPERATURE OF MILK AND RENNETING.

The temperature of the milk when rennet is added is practically the same for both the pressed and blue-veined cheeses, though for the latter cheeses it may be a little lower. Where pressed or blue-veined cheeses are salted from the outside, the setting temperature is as a rule higher. This higher

temperature assists in expelling moisture from the sweet curd, and also allows the salt to penetrate more thoroughly to the interior of the cheese.

Blue-veined cheeses salted in the curd are usually allowed a longer period in which to coagulate, and the coagulum is softer when the curd is cut or removed for drainage. All this tends to retention of moisture. The latter remarks, however, do not apply in the manufacture of Gorgonzola cheese. The milk for this cheese is set at a comparatively high temperature, and sufficient rennet is added to effect coagulation in about one-fourth of the time required for the Stilton or Wensleydale. No acidity is developed in the curd before it is formed into a cheese, and the salt is applied from the outside after a certain amount of acidity has developed in the cheese. In this instance drainage is assisted by heat during the first operation, and not by acid, but, nevertheless, acid is developed before the application of salt.

CUTTING, STIRRING, SCALDING, AND DRAINING OF CURD.

To a greater or less extent all curds intended for cheese-making are broken up. For pressed cheeses, or those cheeses in which blue mould is not developed, the curd is cut or broken into finer particles than for the blue-veined cheese. Fine division of the curd assists in the removal of moisture, and this is the object the maker of pressed cheese always has in view. Stirring of the curd in the cheese-making vat and before the withdrawal of the whey also assists in the expulsion of water from the curd. It is usual also to apply a second heating or "scalding" of the curd and whey while stirring takes place, and when pressed cheeses are to be made. The term "scalding"—though generally used—is a misnomer as applied to the manufacture of cheese, the degree of heat used in cheese-making, except with the Gruyere and a few minor varieties, seldom exceeding blood heat. The object to be brought about by this second heating is the contraction of the curd and the consequent expulsion of moisture from within the particles. Heat also furthers the development of lactic acid, which in its turn is probably the most important factor in the removal of excess of moisture from the curd. Now the maker of the blue-veined varieties of cheese, having for his object the retention of a large percentage of moisture in the curd, does not break it up finely, but ladles it gently into cloths, or, if he does cut or break the curd, this operation is performed very carefully, and the cutting is only partially done. A second heating or "scalding" of the curd is rarely practised, and then the temperature is only raised a few degrees above renneting temperature. The removal of moisture at this stage is only partial, it being necessary and desirable that the excess of moisture should drain away from the cheeses after salting has taken place.

RIPENING THE CURD.

By ripening is meant the acidification of the curd before salting; and this ripening of the curd is the most important factor bearing upon the quality of the finished product. The period at which acidity is developed, and its amount, determines the character of the cheese. Quick ripening of the curd tends to a closeness of texture in the body of the cheese; while a slow, protracted ripening will leave the cheese open and soft. In cheddar cheese-making the curd will be ripe and ready for salting and vatting in from 6 to 8 hours, while for Stilton cheeses it may be from 20 to 30 hours before the proper stage is reached. In the one instance we have a cheese with a close, firm texture, and from which nearly all the remaining excess of moisture will be removed when put to press; while in the other drainage will continue for days after the cheese is salted and formed, and in consequence the body of the cheese will be open, and in a condition favourable for the growth of blue mould.

SALTING AND PRESSING.

Salt is applied to the curd to improve flavour and render the cheese more palatable. It preserves the cheese, and on the amount added will depend the period at which the cheese will be ripe, as it tends to check the development of

acidity, which is the agent primarily responsible for the changes which take place during the curing and ripening process. The salt makes the curd drier and removes moisture by reason of extracting water for its own solution. For a quick-ripening cheese less salt is applied than to a cheese which is intended to ripen slowly or to be stored for a lengthened period. A salt of rather coarse grain is preferable for cheese, as it requires a longer time to dissolve, and thereby has more opportunity of penetrating each particle of curd. There is not much difference in the amount necessary for pressed and blue-veined cheeses respectively. In comparison to the actual amount of solids in the curd more is applied to the blue-veined cheeses, but this is because there is a larger drainage of moisture from the cheese, and consequent loss of salt, and much about the same will remain in each variety of cheese in the end. Pressure is applied to bring the cheese into a marketable and convenient shape; it also removes moisture held by the capillarity of the particles of curd. Heavy and continuous pressure is applied to cheeses which are not intended to become blue-veined. Such pressure results in close texture and a smooth impervious coat, while a cheese in which blue mould is desired is pressed very slightly or not at all, the whey being removed by gravitation and evaporation.

RIPENING OR CURING OF CHEESES.

By ripening or curing of the cheese is expressed a series of fermentations which result in rendering soluble the casein and the development of flavours characteristic of different varieties of cheeses. The curing temperatures usually adopted range between 60 degrees and 70 degrees Fah., and as a rule the new cheeses are subject to the higher curing temperature, a lower temperature being found advantageous in the later stages of the ripening process. Pressed cheeses should be cured in fairly dry, well-ventilated rooms; and an equable curing temperature is desirable for all varieties of cheeses. For the proper ripening of blue-veined cheeses, where much of the moisture is removed in the earlier stages of ripening by evaporation, good ventilation and circulation of air are absolutely necessary; but once the cheese is sufficiently dry a lower temperature and a much moister condition of atmosphere than is desirable for pressed cheeses should be adopted. The true ripening of the blue-veined cheeses depends upon the growth of the mould *Penicillium glaucum* within the body of the cheese. A moist atmosphere with a moderate heat and not too much light favours the growth of this particular mould. It also requires oxygen for its normal development, and for this reason it is necessary that cheeses, which are dependent for their ripening and particular flavour on the presence of this mould, should possess an open loose texture, and a coat through which air carrying the spores of the mould can easily penetrate.

DAIRY COWS.

The quantity of milk yielded by a cow depends primarily on its milk-yielding capacity. The question of food is only of secondary but still of vital importance, while the general management of the cow also has a beneficial or adverse effect—according to whether it is correct or otherwise—on the milk yield. Other factors influencing the quantity of the milk yield are the age of the cow, the milk yield generally being greatest after the cow has had her third calf, and, secondly, the period of lactation; at the beginning of this a larger quantity of milk is yielded than towards the end, as the cow dries off. The operation of milking itself also influences the quantity of milk; a good milker will draw a larger quantity of milk from a cow than will a poor and inexperienced milker. This last point is frequently overlooked, though it is very important, especially in the case of young cows. Great stress should be laid on having them milked by an experienced milker, and the milking not per-

formed in a slipshod manner. In a large herd of dairy cows the extra quantity of milk produced by employing good and experienced milkers, as compared with careless ones, is not inconsiderable. By milking cows three times a day a larger quantity of milk is obtained than if they are milked but twice daily. In regard to this point, however, it must be remembered that considerably more labour and expense are involved by milking three times in the day, and in many cases it may be questionable whether the additional quantity of milk obtained by doing so covers the extra expense incurred. In many instances, also, it would be impracticable to arrange for the cows to be milked three times daily. In the case of heifers with their first calf, the practice of milking them twice daily would favourably influence their milk yield in succeeding years. This last, of course, applies only to such cases where the calves are taken away from the dams immediately after birth.

All these various factors mentioned as influencing the yield of milk in a beneficial or adverse manner are however, of minor importance. As already pointed out, the value of a cow depends chiefly on her inherent milk-yielding capacity. This is a hereditary quality, and such being the case the milk-yielding capacities of a herd of dairy cows can largely be increased by careful selection and breeding. In herds where a large milk yield is desired, special stress must, therefore, be laid on drafting into the herd only those heifers which have been bred from the best or, at any rate, good milkers. The heifer calves of bad or indifferent milkers should on no account be retained, as they will have inherited the poor milking qualities of their dams. By selecting the heifers as just described, and continuing this process for a sufficient length of time, the average milk yield of the herd will be considerably increased. It is not enough, however, to ensure that the dams of the calves retained from drafting into the herd be good milkers. Great weight should be laid on using a bull that has been bred from a deep-milking cow. This point is too frequently overlooked. While in many herds the selection as far as regards the dams of the heifers retained for drafting into the herd is judiciously carried out, little or no attention is bestowed on the question whether the bull used for serving the cows comes of a deep-milking family and has a heavy milker for his dam. On the contrary, not infrequently entirely unsuitable bulls are used in dairy herds—bulls, it is true, which, perhaps, have a pedigree, and which would please the eye of a judge, but whose services in a dairy herd had better be dispensed with. The use of a bull whose immediate female ancestors were or are poor milkers in a dairy herd is much more to be deprecated than the breeding from a poor milking cow and retaining the produce. The bull, it must be borne in mind, influences the milking qualities of all the heifers in a herd. Unless, therefore, the breeding of the bull used for service in the herd is attended to, but little and uncertain progress can be made in the improvement of the milking capacities of the heifers bred. In fact, by breeding from a bull descended from a poor milking family, the benefits accruing from retaining for breeding purposes only good milking cows are to a greater or less extent negatived, according to the degree of prepotency of the bull. Only if both parents are descended from good milkers can it be expected that the progeny will be a good milker if a heifer calf, or get deep-milking heifers if a bull calf.

Breeding from a good milker whose parentage is unknown will not invariably ensure calves which later on will also give a large milk yield. Breeding from animals whose parentage is unknown and which are crossbred must at best be but guess-work and uncertain in its results, as is most in evidence in the breeding of horses. We may have a cow which is a deep milker, yet her heifer calves may fail to possess the same desirable quality. In most cases, and as a rule, however, it will be found that good milking cows produce equally good milking heifers, provided that they have been bred to a suitable bull, as pointed out above. This is due to the fact that deep milkers generally come from good milking families, and that their milk-yielding capacity is an inherited quality and not of accidental appearance; if the latter were the case, it would not for certain be transmitted to the offspring.

In selecting the cows from which to breed heifer calves for drafting into the herd, the best test of their usefulness and suitability is, of course, to keep a careful record of their daily milk yield, as is at the present done in many herds. In fact, it is absolutely necessary to follow this plan if satisfactory results are to be obtained, although it cannot be denied that some extra trouble is involved thereby. At the same time, the benefit resulting from knowing the actual milk record of each cow in the herd amply justifies the extra trouble and labour entailed. In all cases it is the most satisfactory and simplest way to weigh the milk; simple and inexpensive weighing-machines for this purpose are found on the market at the present time. In converting pounds of milk into gallons, or *vice versa*, we may take it as accurate that 10 lb. equals one gallon.

Good milch cows possess certain outward characteristics, which to some extent aid us in forming an opinion as to their suitability for the dairy. Yet this point is of minor importance; an accurate result as to the milking capacities of a cow can only be gained by keeping a milk record. The characters of a good milk cow are, of course, common to a greater or less extent to all cows belonging to dairy breeds or crossbred cows produced by crossing the former. Although we are able to distinguish to some extent, by means of the outward conformation, a cow likely to be a fairly good milker from one which is a poor milker, yet it is impossible to say, by judging from the outward appearance of a cow and the size of the bag, &c., whether she will give 500 gallons or 900 gallons of milk per annum: This fact can alone be established by carefully recording her daily yield.

The size of the bag is of course one of the chief points on judging of the usefulness of a cow for dairy purposes; size, however, is not the only point, the texture is also of importance. By no means are the size and texture of the bag an infallible guide as to the milk-yielding capacity of a cow, although it is not infrequently assumed to be so. The shape and size of the bag of course vary in different breeds; even among the various dairy breeds uniformity in regard to this point does not exist. On the contrary, the dairy breeds in this and other countries possess bags of different types. As an example, the typical udder of an Ayrshire cow may be cited, which is quite different to that of a dairy Shorthorn cow, although both are good milkers. The size of the milk veins, also, to some extent is an indication of good milkers.

Other characteristics which invariably indicate good dairy cows are the following:—A wedge-shaped body, a smallish head, comparative narrowness of the body in front, and wideness behind, large roomy belly, wide and projecting hips, and a skin of good texture.

A dairy cow is not, however, a good milker because she possesses the characteristics just mentioned. It is the other way about—that is to say, because a cow is a good milker, therefore she possesses those points we are accustomed to look for in a dairy cow. In breeding dairy cows chief stress must, therefore, be laid on the actual milk yield. If this is done, the outward points which characterise the build of a good milker will not fail to appear. To breed dairy cattle from their outward conformation alone is eminently wrong, and can never tend to improve the herd as far as milk-yielding capacity is concerned.

As pointed out at the beginning of this article, the feeding of dairy cows is of secondary importance when compared with the question of the individual milk-yielding capacity of a cow. At the same time, of course, the question of feeding is a very important one, and its importance cannot be over-estimated. Putting it shortly, we may say that only those cows will respond to liberal feeding by giving an increased quantity of milk which are really good milkers, and possess good milk-yielding capacities. Cows, on the other hand, which are not naturally deep milkers can never be made so by feeding, be they fed on ever so suitable a food. In their case the food supplied would not be converted into milk—as is done in the case of good milking cows—but it would be stored up in the body in the form of fat, while the nitrogen would appear in the urine,

unless it also is stored up in the body in the form of flesh. This explains the fact why the food of a dairy cow—meaning thereby a cow belonging to a dairy herd, irrespective of the question whether she is a good milker or a poor one—is but of secondary importance, although it is frequently looked upon as of chief and sole import. Naturally good milkers will, even on poor food, not sink below a certain minimum in their milk yield. By liberal and judicious feeding it may be considerably increased, and the maximum yield will be reached when they are fed in the most suitable manner.

In discussing the above points, we are considering the case of dairy herds where the production of milk is the sole object. Where cows are bought and drafted into dairy herds, and later on sold to the butcher when they cease to give a satisfactory quantity of milk or dry off, other points in regard to the feeding must be considered.

The general management of dairy cows also affects their milk yield. Any adverse factors in the management which tend to a reduction in the milk yield will have a much more marked influence on deep milkers, as a rule, than on cows possessing but poor milk-yielding capacity. The greater the milking powers of a cow are developed, the more easily will they be adversely affected by unsuitable conditions.—*Live Stock Journal*.

DEHORNING DAIRY CATTLE.

EFFECT ON YIELD OF MILK AND BUTTER FAT.

(Bulletin No. 78, by Professor Doane, Maryland Agricultural Experiment Station, U.S.A.)

The first dehorning in this country on a large scale of which there is any record was done by an Illinois farmer, who was engaged in the production of beef cattle. Previous to this there had been sufficient experience in the necessary surgical work of veterinarians to know that the horns could be removed from a mature animal without any particular danger to its life. At different places in Europe dehorning had been practised for a number of years, and it is very likely that it was the reports from these places that first led to the practice in this country. It was not long after the first dehorning in Illinois that its advantages were realised, and the practice spread rapidly. The beef herds were the first dehorned, and then the dairy herds, as it was seen that, at times, horns were a disadvantage among milking stock. The idea spread east and west, to some extent, and now, in any part of the country, herds of dehorned cattle are a familiar sight; while in the middle west, among the large beef raisers and even among the dairymen, the great majority of the herds are dehorned. Especially is this true among the working herds of cattle. In show herds the consideration of natural appearance of the animal retain the horns.

At a number of the experiment stations exact records of the daily milk yield before and after dehorning have been kept. In a few instances the per cent. of butterfat has also been noted at each milking for a few days before and after dehorning, and from these we can make a pretty fair estimate of the effect of dehorning on the dairy cow.

At the Wisconsin experiment station, a record of ten cows was kept for the four milkings before dehorning and four milkings immediately following dehorning. The ten gave 289.3 lb. in the four milkings before, and 243.6 lb. in the four milkings after dehorning—a loss of 45.7 lb., or 16 per cent. Each cow was tested two milkings before dehorning, but four milkings after dehorning. In every case but one the milk tested much lower the milking immediately after dehorning than it had tested the two milkings before dehorning. But the test gradually increased, until it was much higher than it had been in the milkings previous to dehorning, and the actual amount of butterfat produced by the cows was as much or more than it would have been had the cows not been

dehorned. At another time, at the same station, twelve cows were dehorned, with a loss of 5 per cent. in the total yield of milk in six days after dehorning, and a gain of 4 per cent., in the total amount of fat produced in the same time. A record of the weights of the cows before and after showed practically no loss due to the operation.

At the Minnesota Station nine cows produced 7 per cent. less milk in three milkings following dehorning than they had given in the three previous milkings, and produced 8 per cent. less total butterfat in the same period. Six cows which had been kept where they could see the excitement and smell the blood lost 3 per cent. in their milk yield, and 1 per cent. in their total butterfat in the same time, showing that the slight loss of the dehorned cows was due partially to excitement. A weak feature in this record was that three milkings were selected, making two nights' and one morning's milking in one period, and two mornings' and one night's milking in the other period. Cows seldom give the same at morning and night, and the test nearly always varies at these two milkings.

At the Georgia Station, nine cows made an actual gain in milk yield the day following dehorning.

At the Tennessee Station, nineteen cows were dehorned, and in ten days they lost only 34.2 lb. of milk from a total previous ten days' yield of 2,784.3 lb.

The new York Station, at Cornell, found that five cows lost an average of 1 lb. a day for four days following dehorning. Seven cows not dehorned lost an average of $\frac{1}{2}$ lb. a day in the same time. One of the dehorned cows lost an average of 4 lb. per day in the record time.

At the North Dakota Station, fourteen cows were dehorned. Most of them fell off in their milk slightly, but gained in per cent. of butterfat, and at the fourth milking all were back to their normal flow. The fourteen cows made about 1 lb. less in the two days following dehorning than they had made in the two previous days.

From these reports it appears that there is a very small per cent. of loss in the total amount of milk produced, and very little, if any, loss in the total fat produced in the first few milkings following dehorning. In the majority of recorded trials the cows came back to their natural flow of milk in less than a week, often in two days. Judging from this, there is no amount of pain suffered by the cow, and practically no loss in product resulting from the operation. It must be emphasised that as far as our knowledge of the dairy cow goes at the present day, we would be practically sure that any protracted pain, or any great physical shock, would lead to a material reduction in the amount of milk produced. It seems that the excitement of the cows caused by handling them in a manner to which they are not accustomed, is almost as operative in reducing the milk flow as the dehorning itself.

THE MANAGEMENT OF SWINE.

Mr. Lewis Price, who manages the live stock at the Goodna Asylum, writes:—

As I am indebted to you for information on several things, I will give you a short sketch as to how I manage the swine at the Woogaroo Asylum. There may be some little hints that will be of service to your readers. We keep, on an average, forty breeding sows to consume all the waste food, &c., that comes from the wards in the institution. Firstly, I will take the sucking pig. As soon as the young pigs are two weeks old, and I want to mature them quickly to get up a litter for show purposes, I provide an empty sty next to that of the sow and litter. Our stys being built on the slot principle, 6 feet wide by 10 feet in length, I raise the boards about 8 inches, so that the little ones can run from one sty to the other free from their mother. I feed them on boiled maize meal and milk, and after feeding on that for a few days I gradually change

the diet to something more solid, such as a little meat and odd scraps from the swill tub. As they grow bigger I raise the boards connecting them with the empty sty, so that, when it is time to wean them, all I have to do is to let the boards drop.

Now as to the young gilt. In selecting the same I always pick the strongest of the litter, with not less than twelve teats of an equal distance apart. She is fed well till she is six months old. I then put her in a yard and feed her with plenty of coarse food, so as to expand her digestive organs. The reason why this is done is that when she becomes a mother she will be able to consume a large amount of food to produce a plentiful supply of milk. I put her to the hog at eight months, so as to have a litter at twelve months. After this I do not keep her too fat till within two weeks of farrowing. Then I feed her with richer food, and, if she is not inclined to make much milk, I mix bran in her food for a week or two before and after farrowing. I am a great believer in bran for milk.

Before the sow is going to farrow I put her in a clean sty—one sty clear from the other pigs—and arrange a frame to keep her from lying on the little ones. I bed lightly with coarse chaff. Hay and straw are too long, as the sow is sure to gather it up close to her, and sometimes the young ones cannot get round to the teats, especially if they have strong anus strings, the consequence being that you may lose some of the little ones. All the bedding that is required is just sufficient to absorb the moisture.

Most writers say there is no cure for sows who eat their young. I beg to differ, for among forty sows in twelve years I have had not a few among them which ate their young, yet for the last ten years I have never failed to cure every sow. As a rule, it is young sows on their first litter that eat their young. Anyone who has seen a sow eat her young can tell when she has farrowed a pig, for he squeaks; then she jumps up and bites him, and in most cases fatally. Then she lies down and farrows another, and gets up as before to bite it. She notices the blood from the first one, begins to lick it, and then devours, in most cases, the whole lot. When a sow is able to jump up and devour her young, she cannot be very sick. She is probably only excited, or may we call it a case of temporary insanity? For some reason or other sows have a better time farrowing in this country than in the old country. In England a sow never leaves her bed until the lapse of from twelve to twenty-four hours, and in some cases longer. But, here, I have seen sows get up and feed in the middle of farrowing. When I have a sow that has eaten her young, I always take care to put her in a very quiet place, and want her to be very sick when she farrows, so I pick all the scraps of meat out of the swill tub and give her as much as ever she can eat for about two days before, and on the last day before farrowing I mix half a bottle of castor oil with her food, which will make her feel very bad and want to lie down. There is, of course, the risk of having some of the young pigs stillborn, but the sow will not get up for eight or ten hours. By that time she will have got quite used to the little ones and will not injure them. I have seen a sow get up and vomit, but take no notice of the young. Only one sow have I failed to cure on the second litter, but cured her on the third, and have her now with her fifth litter of eight pigs, and she is a good mother. After she had eaten her second litter, and was a show pig, I put six young pigs four weeks old to her and made her rear them. Perhaps some other way of making them sick would answer quite as well.

A word or two about boars. Young boars will work at six months with young light sows. How long they will work is a matter of keeping them active. I have one working now seven years old. I keep old boars active by keeping a young one in the yard with them so as to keep them moving to try and catch the young one. Before I put the youngster in with the old one I always take the precaution to take the tusks out of the old one. I have a very simple method of doing this. Cord him by the snout and tie him to a post. Take a pair of blacksmith's shoeing pincers with a sharp edge in one hand and a hammer in the other. Get hold of the tusk close to the gum, give the pincers

a good sharp blow with the hammer and off comes the tusk. Always strike the pincers towards the snout. I find this plan much easier than sawing them off, and not so liable to injure the mouth. In concluding, I want to say a word or two on pig judging. I have been in charge of exhibits and have had the selecting of the same for a number of years. I think the judges should be supplied with cards to fill in the number of points, so that every competitor can see where his pig is deficient—a card similar to the one I enclose.

Finally, my motto is—cleanliness and plenty of room, and you will never have any pig disease. We have never had any here. I may at some future date give you my experience of swine fever and foot-and-mouth disease in the old country.

JUDGES' CARD.

The Points of a Good Improved Berkshire Pig.		Class Boars.		Class Sows.		Class Sows.		
		1	2	3	4	5	6	7
1.—Head wide in front, ears erect and pointed forward	6							
2.—Chest wide and rising well to the shoulder, shoulder-blades well sloped backwards	6							
3.—Ribs well sprung, loins wide and slightly arched	10							
4.—Hind-quarters not to slope nor narrow towards the tail	10							
5.—Hams well let down and full at the twist	12							
6.—Chest wide and elbows well out	10							
7.—Fore-ribs wide underneath, flanks well let down and straight	12							
8.—Legs straight and small in the bone, feet small and compact	10							
9.—Tail thick at the root and tapering to a fine point	4							
10.—Hair plentiful, bright, and vigorous	8							
11.—Markings—four white feet, white blaze, and white tip	6							
12.—Size, medium; extremes undesirable	6							
PERFECTION	100							

THE FRUIT FLY.

PRECAUTIONS TO BE TAKEN IN FRUIT-GROWING DISTRICTS.

Mr. S. C. Voller writes as follows on this subject:—It would be a good thing to get the Press in fruit-growing districts, especially Brisbane, Toowoomba, and Warwick, to insert a paragraph or two urging *all* owners of gardens and orchards to fight the fly at every point and in every possible way, especially by gathering and destroying all infested fruit by boiling, as by this means much can be done to reduce this evil and the loss resulting. We need every precaution to be taken in the Toowoomba and Warwick districts, as we are largely interested ourselves through the State farm orchards, and it will be a great pity if our own efforts are to be nullified by the carelessness of others. We run a serious risk through careless growers in the neighbourhood of our farms.

The Horse.

DISEASES OF THE HORSE.

By VET.

COLIC.—Colic is of two kinds—spasmodic and flatulent. I will deal with the spasmodic form first. It is a spasmodic contraction of the muscular coats of the bowels, which may run on to inflammation. The causes are indigestible food, sudden changes of diet, exhaustion from overwork, particularly if a long time without food. Large draughts of cold water do not produce colic unless the animal is sweating profusely or exhausted from a long journey.

Symptoms.—Sudden pain, pawing, kicking at the belly, looking round at the flanks, lying down, rolling, struggling in a variety of ways or lying outstretched, then suddenly rising, shaking the body, remain for a short time free from pain. After short intervals the symptoms return, sometimes with greater at others with less violence, until either relieved or death occurs from inflammation of the bowels, pain, or exhaustion. During the pain the breathing is quickened, sighing or panting, the pulse beats faster and is full and hard in character; again, when pain ceases the pulse regains its normal condition until another attack occurs, when the pulse will again rise. At the commencement of the attack there is generally a frequent evacuation of a small quantity of fæces, which are sometimes hard and at others soft; the urine is passed in small quantities, or a horse will often try to stale but without success, and if the hand be passed up the rectum and the bladder examined it will be found to be distended, more especially if the animal has been fed on green diet.

Treatment.—Linseed oil, 10 oz.

Laudanum, 1 oz.

Sweet spirits nitre, $1\frac{1}{2}$ oz.

Mixed to form a draught.

Or,

Aloes, 3 drs.

Sweet spirits nitre, $1\frac{1}{2}$ oz.

Extract belladonna or laudanum, 1 oz.

Water, 5 oz.

Mixed to form a draught.

Either of the above can be given to start with, but if not relieved in three hours should advise to be followed with sodium hyposulphite 1 oz., water 8 oz., at intervals of three or four hours. The hand ought to be passed up the rectum and the back gut relieved of the fæces, and, if possible, an enema ought to be given.

FLATULENT COLIC, whether occurring primarily or subsequent to an attack of spasmodic, is a condition from which more serious results are to be apprehended than of the spasmodic form of colic. The causes are weakness of digestion, but most commonly from food which easily undergoes fermentation—viz., raw potatoes, the clover family, brewers' grains, wheat, and boiled foods.

Symptoms.—In this form of colic the expression of pain, though not so violent, is much more constant than in the spasmodic form, the abdomen is more or less distended with gases, and upon tapping will be found to have a

drum-like sound; the pulse is rapid and feeble, the breathing difficult and mostly chest breathing, the extremities cold, there is more or less delirium, the animal reels to and fro; twitching of the muscles, retraction of the lips, and if relief be not afforded death ensues either from asphyxia, blood-poisoning from the absorption of the gases into the blood, or rupture of the bowels. When the animal lies down or rolls it is observed that it performs these acts more carefully than when suffering from spasms. Flatulency occurs from other causes, such as calculi, tumours in the intestinal canal, or mechanical, such as, for instance, a twisted gut.

Treatment.—An aperient should always be given to start with if the horse has been fed on dry food: 5 to 8 drams of aloes made into a ball with a dram of ground ginger, according to the size of the animal, and something to check fermentation, such as hyposulphite of soda or carbolic acid. If, however, the tympanites be severe or seem to increase, the colon ought to be punctured by means of a trochar and canula. The method of procedure is as follows:—Select the most prominent part of the swelling, which is generally about midway between the last rib and anterior spine of the ilium upon the off side, smear the part where you are about to make the incision with carbolic oil, then cut through the skin and insert the point of the trochar in a slanting upwards and inwards direction which will allow the escape of the gases and also any after fluid to drain away which may afterwards form, and thus prevent the formation of an abscess; when the bowel is punctured the stillete is withdrawn, and in order to prevent further fermentation it will be necessary to inject by means of a syringe through the canula about half-an-ounce of pure carbolic acid dissolved in 20 oz. of warm water into the intestine. Pulse of the horse is about 40 per minute.

INFLAMMATION OF THE BOWELS.—Inflammation of the bowels may be considered to be the most rapidly fatal inflammatory disease to which the horse is liable, destroying life in the course of a few hours; the causes of the above disease being over-fatigue, cold from exposure or washing with cold water when the animal is heated, and also as a sequel to colic.

Symptoms.—The first noticeable signs are those of abdominal pain, generally preceded by rigors, accelerated breathing, repeated evacuations of small quantities of feces, and general depression; the mucous membrane soon become congested, the mouth dry, the tongue contracted and sometimes of a brownish colour, entire loss of appetite; the pulse is hard and wiry and quick, ranging from 80 to 120; the belly may seem tucked or distended with gases and tender on pressure. As the disease advances, dullness and depression give place to those of excitement and pain; the horse then stamps the ground with the feet, lies down but much more carefully than in colic, or makes feints to do so; it may roll upon its back, pants, blows, and sweats with pain. As the disease further advances, the pulse becomes thready and almost imperceptible, the animal sighs or even groans with pain, the sweat runs off the body, the skin is never dry—at one time hot, at another cold. The legs and ears become deathly cold, and then death.

Treatment.—Avoid purgatives. Subcutaneous injections of meconate of morphia, 5 to 8 grains, every four or five hours with $\frac{1}{2}$ -grain of atropia every twenty-four hours. Hot fomentations to the abdomen and continuously applied at least for one hour or more; enemas not to be given, however hot, too frequently, and if at any time they increase the pain to be discontinued. If the animal is in good condition and the pulse full, bleeding may be resorted to, but not sufficient to weaken the animal, and only in the first stages.

Poultry.

LAYING RECORDS.

QUEENSLAND AGRICULTURAL COLLEGE.

The following are the records of eggs laid during the three months ending 31st October. I may state that some of the fowls had not commenced to lay during the first month, so that their records will seem low in consequence. The fowls have not been in any way forced or stimulated for a large egg-production. The records kept are from the breeding pens only. They were fed on a plain diet—namely, pollard in the morning and wheat at night, with a little green food, such as cabbage-leaves or lucerne, at midday:—

—	No. Hens.	Number of Eggs Laid.			
		August.	September.	October.	Total, 3 Months.
Buff Orpingtons	5	80	80	75	235
Brown Orpingtons	3	39	45	42	126
Black Orpingtons	4	44	48	64	156
White Wyandottes	7	84	98	91	273
White Leghorns	6	84	78	72	234
Silver-laced Wyandottes	5	55	70	65	190
Silver-grey Dorking	5	30	85	70	185
Plymouth Rocks	2	12	30	28	70
Black Spanish	6	63	78	60	204
O. E. Game	5	25	70	65	160
Minorcas	3	18	30	42	90
Langshans	3	15	33	36	84
Light Brahmas	3	0	18	42	60

It will be noticed that some pens which made a bad start are coming on now, so that the results of the next three months may alter some of the positions.

TURKEYS, GEESE, AND POULTRY.

No. 2.

REARING GEESE.

As the goose is the earliest occupant of the poultry-yard to start breeding, it may be useful to the readers of this column to investigate the various breeds, and study their identification and general characteristics, for in geese, the same as ducks and fowls, there are varieties which are more adapted for laying purposes than others; while, on the other hand, there are those that are better fitted for table use than otherwise. As an early layer, its requirements must be looked to in good time. In fact, they have already mated, and in some instances started laying; nevertheless, there is plenty of time. Those thinking of breeding should select their stock. Geese should pay the farmer for keeping, as it is he that has the wide and open fields wherein they love to wander, and in which situation they thrive best, providing that there is a sufficient amount of green grass for them to nibble at. The spring season is in every way fitted for their propagation on an economical scale. Grass forms quite half the diet of the goose and her goslings, for when the young are only a day out of their shells, or even younger, they will be seen picking at the little blades of green grass if placed in the sunshine where they can be quiet. It must not be inferred that there will be no trouble or feeding needed. It is

good that some trouble should be needed even in the producing of geese. Consider the price of geese as shown by the markets throughout the year, and look at the quantities sent into the city markets during the Christmas season, and the comparatively small amount realised at this festive season, which is really the harvest of the year as far as geese are concerned, for they are not so much sought after at other periods. The birds at these sales for the most part are of no strain at all, and it would puzzle the renowned "Philadelphia lawyer" to tell the crosses they constitute, for the pure strain, if any ever existed, has run out ages ago, and the progeny now submitted have become ill-shaped and ill-flavoured altogether. This, coupled with bad management in fattening, culminates in extremely low prices, not only for these poor birds, but also makes a standard by which the better ones are judged. There needs to be an all-round improvement in the stock birds, and undoubtedly better results will be the consequence. Start by securing a pure-bred gander and a couple of geese, if funds will not permit more, and start systematically to breed from these, bearing in mind that inbreeding must be avoided, or else the same results will soon follow. If the progeny is kept next season, new strains must be mated to these to keep the blood in good order and the frame and constitution robust.

In choosing the stock birds, care must be taken that they are perfectly healthy, and are free from inbred blood, for a bad start is ruinous. Select good large birds. It is not necessary for them to be excessively fat, for over-fatness is rather an impediment to prolific breeding. Nevertheless, the frame must be there, with a good display of meat in the right quarters, with the breast full and broad. When the stock birds have been secured, they will need to have a little alteration in pairing; for should more than one gander be kept in a confined place there will sure to be war sooner or later until they are properly mated, for ganders are noted for quarrelsome propensities. Then see that the nests are supplied with plenty of clean fresh straw. I say "plenty," for there is nothing in the poultry-yard that can beat the goose or swan in packing up its nest. Care must be taken to place the nests apart as much as possible, as, if put side by side, with no protection, a fight often takes place, in which it may be that a nest of eggs that have been sat upon for some time becomes destroyed and much time is lost. When the young come out they should be placed near green grass, and given soft food, such as a little bran and pollard mixed up, so that the small flakes will crumble up about the size of a split pea; but little water is needed, and this can be supplied in a sardine tin that has been well rinsed out with hot water. In a week or two the goslings will be well out of the way, and start looking out for themselves, their parents taking them away for the best part of the day, and returning at night to seek shelter in the yard or near a haystack. It must be borne in mind that a month before sending into market, or before selling for table purposes, the young geese should have plenty of food of a fattening character. Bran and pollard in the morning are good, with wheat at night, and the midday meal of grain is also advisable. Give as much as the birds can eat. Although the market price for geese at Christmas time ranged about 2s. 6d. to 3s. 6d. each, yet prime geese, reared much on the same principles as I have advocated, have brought 6s. to 7s. 6d. each. There are plenty of customers who are ready and willing to give top prices for the prime article, and even the ordinary dealer and poor consumer will be willing to give more for birds with meat on them than for the small scrubby frames generally offered them.—*Adelaide Observer*.

THE HISTORY OF GEESSE.

By J. J. McCUE in *Station, Farm, and Dairy*.

The true species of geese belong to the genus *Anser*, and number about twenty varieties. One of these—the Greylag goose, *Anser ferus*, the origin of most of our domesticated breeds, is a bird of very wide range, being found in most European countries from Lapland to the north of Spain and Bulgaria in

the south, and throughout Asia to China, but does not seem to have been found in Japan. It is the indigenous bird of the British Isles, and in former times bred freely in the fen and marshy countries, where the young were caught in large numbers and domesticated with the tame flocks. The wild goose generally laid from six to seven eggs, the nest being made in reeds or heather. Under domestication the Greylag goose has increased in egg-production and size, while the plumage has become lighter in colour, being more or less marked with white.

VARIETIES OF GEES.

The varieties best known in the Commonwealth are: Toulouse, Embden, and African or Cape geese. The other classed varieties that are known are: The Egyptian, Canadian, Chinese, Danubian, and Russian. There are several other varieties, but the above are considered the most profitable under domestication.

Toulouse.—This variety takes its name, rightly or wrongly, from the city of Toulouse, in Southern France, where they are reared in large numbers. They are the largest of domestic geese, and frequently attain a heavy weight, pairs of ganders being weighed at English shows that tipped the scales at 50½ lb. Their general appearance is a square, massive-looking body, thick head and neck, the throat showing a fold of pendant skin—known as the “dewlap,” the body carried fairly horizontal, the folds of skin between and behind the legs nearly touching the ground. The shoulders should be broad; neck medium in length and moderately thick; the head and bill strong, and presenting a fairly uniform curve over the top to the bill, which is orange-coloured, with a flesh-coloured nail at the end of it. The feathers of the neck are curled or twisted from the head towards the shoulders. The back, wings, and thighs are of a dark, even, steel-grey colour, each of the feathers being laced with a much lighter shade, nearly a pure white. The flight feathers are free from this lacing. The breast and under parts are of a clear grey, running into a lighter shade near the thighs, until white at the abdomen and under the tail. The stern and paunch should be pure white, not mixed with grey as seen in some specimens. The tail also is white, and across its centre there should be a broad band of grey. There seems to be contrary opinions among some geese-breeders as to the proper colour of the eye. The eye should be brown or hazel, the rim usually the colour of the beak. The legs are rather short, stout, of a deep reddish-orange colour, and placed well apart. The gander and goose are exactly alike in colour and feathering, and it is often difficult to distinguish the sexes. Standard weights are:—A two-year-old gander, 28 to 30 lb.; young gander, about one year old, 18 to 22 lb.; two-year-old goose, 20 to 22 lb.; and one-year-old goose, 18 lb.

In breeding the Toulouse variety, size is very important. We should have the breeders as large as possible, and as near correct type, colour, &c., as we can get them. The Toulouse is a very fleshy variety, and, given a large frame, will carry a large amount of meat, though some say it is a little coarser than the flesh of other varieties. It is not a quick grower, compared with other varieties; still it is not very far behind the quickest growers of the other geese. There are very, very few pure-bred Toulouse geese in the State; those seen at our best shows being anything but good type, size, or colour.

As layers, the Toulouse can be classed as good, the goose often laying from forty to fifty eggs in a season. They are not good as sitters; in fact, some geese do not sit at all.

Emden.—The Emden or Bremen geese originated in Holland, and when first introduced into the United States of America from Bremen were given that name after the city of Bremen. All authorities agree that this variety gained its name from the town of Emden, in Hanover; at any rate, it is known by that name wherever the variety is kept.

The true type of Embden differs in appearance, apart from colour, from that of the Toulouse. The neck is longer and finer, the head leaner and longer, and the dewlap is wanting. The shape of the body is not so deep in front, or carried so low between the legs, hence it appears taller and slighter than the Toulouse. The back is broad, the body compact, more tight-feathered than the Toulouse, which makes the bird look smaller than its loose-feathered cousin. It has the same curled or twilled appearance of the neck feathers, but the abdominal pouch is but slightly developed as compared with the Toulouse, consequently the bird appears taller and higher from the ground. The neck and head should be of medium size, not too large or too fine. The eye is bright blue, and the rim the colour of the bill. The plumage is a pure white, without any coloured feathers whatever, the only change being in legs, bill, and feet, which should be bright orange. The nail at the end of bill is nearly white, and so are the toenails.

The Embdens scale heavier than they look on account of being tight-feathered, and attain nearly the same weights as the Toulouse. As layers they lay as many eggs as the Toulouse, but they lay earlier and their eggs are slightly heavier. They are model sitters and mothers, the goose being very careful with her brood, and one that protects them with great spirit.

In breeding Embdens care should be taken to have the geese as large as possible; the geese of this variety being smaller than the gander. The goslings of this variety are generally hardy, grow rapidly, which is an important point in their favour. At the time a Toulouse gosling is in a lanky condition an Embden of the same age would be plump and fleshy; and when killed and dressed their nice white colour makes them more attractive than the coloured varieties.

African or Cape.—It seems a very difficult task to trace the original home of this variety. It has been known under so many names—Guinea goose, Spanish goose, &c., and its home given in five or six different countries—that 'tis a puzzle to know which is correct. Mr. J. K. Felch, a prominent poultry breeder and judge in America, says: "The African goose, I believe, has been credited to Africa—the region near Zanzibar. It is a goose as heavy as the Embden or Toulouse; has a shorter, thicker neck, and darker grey colour than the Brown China; knob and bill are black, with a prominent dewlap, and a voice harsher and heavier than all others. My own belief is that it is a species indigenous to Africa. We cannot say that it is like the Brown Chinas or the domestic goose of India, all of which have longer and more swan-like necks, while the African weighs all out 6 lb. more than the Chinas. I think that they were imported to this country before the White and Brown Chinas were received."

In my opinion, the African and Chinese geese came from the same stock, the Chinese being the original; selection and climatic influence have given us the African. I favour the Chinese with being the original stock, because of their smaller size, habits of flying, and other little ways that remind us of the wild goose.

The African geese have a more erect appearance than either the Toulouse or Embden; the body is large and long, well developed about the shoulders and breast; the neck fairly long, of fair size, and nicely curved, the head rather large, bill stout and not too long, and a knob at the base of the upper mandible. This variety should have a heavy dewlap or pendant fold of skin under the throat. The bill and knob are of a black colour, and the eyes hazel or brown; the colour of the back, wings, and tail is dark-grey, shading to a lighter grey on the breast and under parts of the body. A dark-brown stripe extends from the head down to the back of the neck; the legs and feet are dark-orange colour, with toenails black. The weights are: For adult gander, 20 to 22 lb.; young gander, 16 to 18 lb.; goose, 18 lb.; and young goose, 14 to 16 lb. This variety lays a very large egg, and sometimes more than the Toulouse or Embden varieties. The goslings put on flesh quickly, and are ready for market early;

there is one drawback to them being a nice market carcass—and that is the dark pin feathers, which give the body a dark appearance.

The variety known in the colonies as Cape geese are closely allied to the Brown Chinas of America; in fact, are more Chinese than African. There are two varieties of Chinese—the white and the brown—both of which are smaller than the Toulouse, Embden, or African. The white China's body should be round and full, the neck long and nicely arched. In walking the carriage is very upright, the neck and head carried well forward, giving the bird a tall and bold appearance. The head is fairly large, bill rather long but slim, excepting at the base of the upper mandible, which should have a large knob. The colour of knob and bill should be orange, the bill having a white nail. The eyes are bright-blue, with orange rim. The plumage is a pure spotless white, the legs and feet orange, with white toenails.

The Brown China is the same in size, weight, and shape as the white. The colour of the plumage is nearly the same as the African, except where the African is grey the Brown China should be brown. The head and stripe down the back of the neck should be dark-brown, wings and tail brown, other plumage greyish-brown shading, lighter on the under parts of the body. Legs and feet dark, with a greenish or orange tinge, and toenails black. The eyes should be bright, large, and brown or hazel in colour. The weight of a good adult Brown China gander should be at least 15 lb.; adult goose, 13 lb. to 14 lb.; young gander, 12 lb.; and young goose, 10 lb. The China geese are not bred extensively for market purpose, geese-raisers preferring the Toulouse, Embden, or African; they consider the Chinese too small. Yet, when a small-boned and medium-sized carcass is wanted, this breed "fills the bill." As layers they are good, very hardy, and grow quickly if on a good run or cared for properly.

AUSTRALIAN GEES.

We have two distinct varieties of geese belonging to Australia—the pied or half-webbed goose, and the small *Cereopsis* goose. Both varieties, especially the latter, were at one time fairly plentiful in this State, but are now only to be found in the quiet, sparsely populated districts.

The Black and White Goose.—The pied variety, the larger of the two, have the front toes only webbed at the base, and the hind one is long and not raised above their level, and furnished with a large claw. The lores are naked. The metatarsus is reticulate and longer than the third toe. This bird is about the size of the Brent goose, and has a dull black and white plumage, a hooked beak, with a large warty, comb-like prominence on the front of the head; the claws are long and sharp, and the whole foot is adapted for perching on limbs of trees, &c.

Cereopsis Goose.—This goose, *Cereopsis novæ-hollandæ*, is best known to us as the "wood duck," "tree duck," and "grey duck," many being under the impression that it is a true duck and not a goose. This is a more terrestrial type of goose than any now existing, and its osteological characters point to a relationship with a New Zealand goose (*Cnemiornis calcitrans*), of large size, that could not fly, and is now extinct. It has a short decurved bill and greenish cere; the plumage of the female is a grey colour, with rounded black spots; the male has a blackish neck and back. This variety may be kept in parks or gardens, and will thrive in captivity, but I have never heard of them being domesticated so that they would breed.

SCALY LEGS.

Scaly leg, sometimes called scurfy leg, is not, as has been assumed by some, the same thing as elephantiasis in human beings. The real cause of the trouble is a parasite, an acaris something like the itch insect in man. It burrows under the scaly portion of the leg, and increases there until, if neglected, the whole shank is covered with a thick accumulation of scurfy

matter, more particularly in front. The remedy is to soak the legs well in soap and water, with a little soda or pearl ash added, as hot as can be borne for ten minutes. After drying, rub in an ointment composed of equal parts of lard, sulphur, and kerosene. Do this every other day, and the scales will soon drop off. Do not use kerosene alone, as it is likely to irritate the flesh. If the roosts are washed with kerosene occasionally, the trouble will not appear.

LICE.

All birds are troubled more or less with lice called *Trypodyctes*. One variety affects ducks and geese; two, the peacock; three, the turkey; four, the pigeon; and five, the hen. These lice have strong biting jaws, and cause great discomfort to poultry, interfering with their feeding and rest, and so proving detrimental to their growth and laying qualities. The lice are especially troublesome during the summer to sitting hens. Various remedies have been suggested, such as camphor balls in the nest, scented wood shavings, lime, and different kinds of insect powders. A dust bath, however, is a most valuable remedy, especially if some good insect powder is scattered on it. Washing the whole poultry house, nest boxes, roosts, and walls with hot lime and water is an excellent help. When using lime, take care that the fowls have no access to unslaked lime, as it is deadly to them.

PIP.

The cause of pip (scaly matter on the tongue of chickens) is the closing of the orifice of the nostrils by the thick discharge of mucus in roup or gapes when the chicken is forced to breathe through its mouth. It may also arise from disease of the stomach or other organs. Find out if any of these symptoms appear, remove them, and the effect will cease. Smear the tongue with pure glycerine, and when the scaly matter on the tongue is loose remove it and apply glycerine.

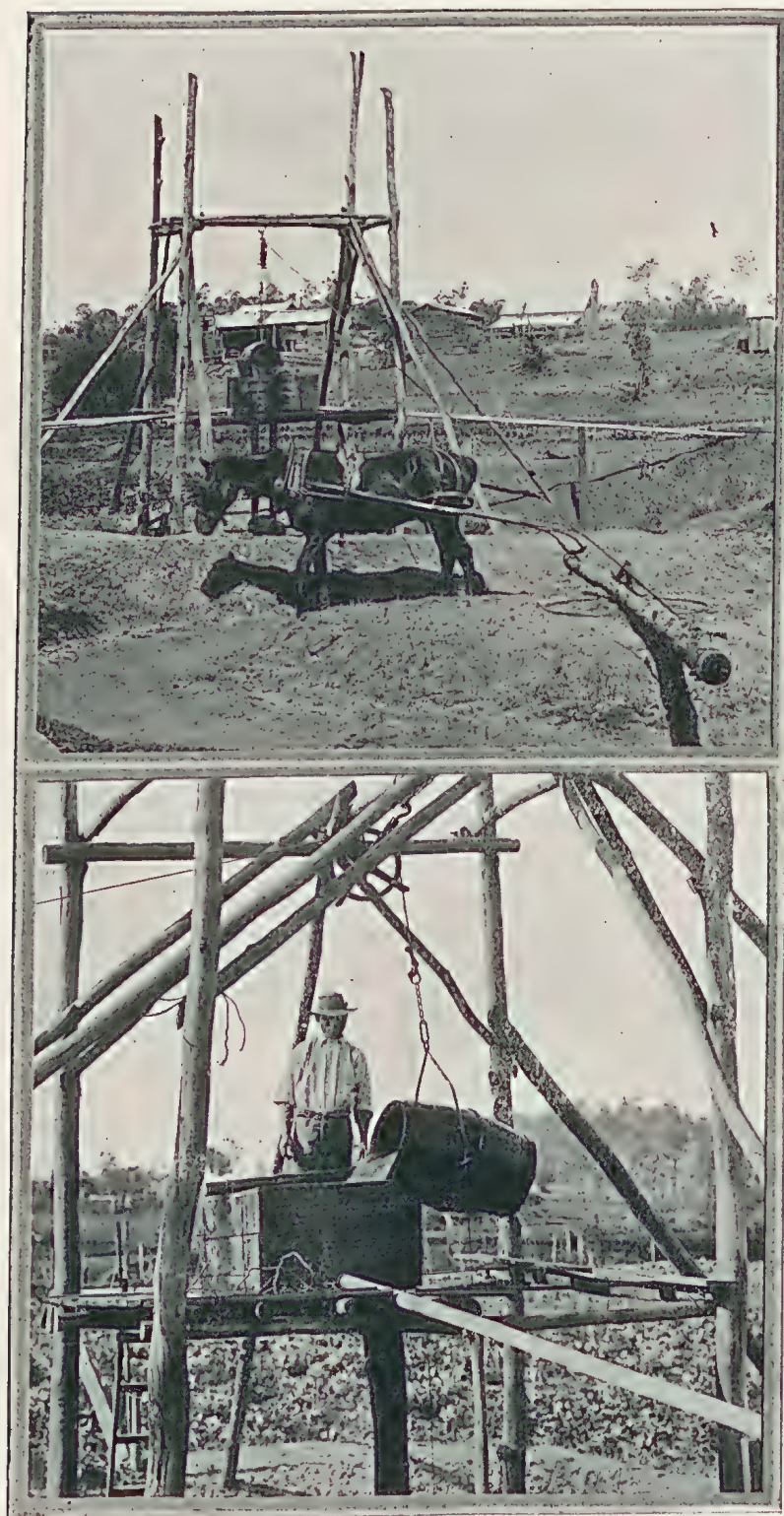
SHEEP AND CANE.

The *Delta Advocate*, Ayr, Lower Burdekin, reprints an article from the *Bundaberg Mail*, in which it is stated that a farmer turned a flock of sheep into a field of cane he intended ploughing out with the view to giving the sheep a treat; to his astonishment the sheep never touched the young shoots of cane, but cleared up the field in a most splendid manner, though it was covered with summer grass and weeds.

A cane-grower on the Burdekin delta, Mr. Craig, had the same experience. He purposely turned a flock of sheep into a field of plant cane, as he found that they did the cane no harm, but cleared out every weed, never touching even the most tender shoots of cane.

On hearing the results from Mr. Craig and after examining the cane, Mr. Douglas Brown, manager of the Pioneer plantation, declared his intention of putting a flock of rams that are in the Pioneer paddock into one of his own fields of cane. Is it possible that a flock of sheep can take the place of a weeding gang, and thus solve the kanaka question? On mentioning the foregoing to the Hon. Angus Gibson, he informed us that equally successful experience with sheep in eating down weeds between the cane rows has been gained on Bingera. It appears that except where the cane is very young the sheep will not eat it, though they devour the weeds most greedily. A representative of the *Advocate*, speaking to Mr. Craig on the subject, elicited the information that after the cane is a foot or so high the sheep do not harm it; it is only when the shoots are very young and tender that any destruction is caused.

Plate VI.



A WATER-LIFTING APPARATUS.

Horticulture

A SIMPLE HOME-MADE WATER LIFT.

By ALBERT H. BENSON.

Under the heading of "Notes on Irrigating Orchards and Vegetable Gardens," which appeared in the November number of this *Journal*, I mentioned, when speaking of water lifts, that I had recently seen a very simple and inexpensive contrivance in use by a Chinese gardener in the neighbourhood of Brisbane, that was doing good work at a small cost. Several persons having asked for further particulars respecting this home-made water lift, and thinking a more detailed description may be of interest to the readers of this *Journal*, I have had it photographed when in work, so as to clearly show its method of construction and working. The photographs are reproduced herewith, and should enable anyone who wishes to do so to erect a similar plant.

The garden referred to is that of Charley Ah Sue, and adjoins the Kelvin Grove bridge, the water being obtained from a hole sunk in the old bed of the Kelvin Creek.

The hole from which the water is obtained is slabbed so as to prevent the sides caving in, and when full holds several thousand gallons, though at the time of my visit the supply was not strong enough to stand constant use, the water lift taking the water out faster than the inflow; still the supply was ample for all requirements.

A rough brace is built over the waterhole, on which a platform is fixed at a sufficient height to enable the water from a wooden tank placed thereon to run by gravitation to the distributing ditches used for watering the vegetables. The method of raising the water is as follows:—On a level piece of ground some 40 feet from the surface of the waterhole, a hardwood stump from 2 to 3 feet long and a foot in diameter is sunk to the level of the ground, and taking the stump as a centre a strong wheel tyre is also placed on the ground, the level of the top of the tyre being the same as that of the stump.

A heavy iron bolt is then driven firmly into the centre of the stump, and the portion of this bolt left above the stump acts as a pivot on which a stout sapling some 21 feet long is rotated. The bolt passes right through the centre of the sapling, the hole in the sapling being large enough to allow the sapling to be rotated easily round the pivot, the wheel tyre giving a firm support to the sapling when rotating. The iron bolt after passing through the sapling also acts as a support for two iron stays attached to the sapling. This is clearly shown in the illustration. A strong eye-bolt is attached to one end of the sapling, the distance from the eye-bolt to the pivot being exactly one-half the height the water has to be raised; hence the longer the sapling the higher water can be raised, although too long a sapling would be unworkable and slow.

To the other end of the sapling a swingle-bar is attached to which a horse can be yoked. From the eye-bolt a stout wire rope is carried to a grooved pully attached to a strong crosspiece on the top of the brace, the other end of the wire rope being firmly attached to a stout iron handle fixed to a 30-gallon cask. When the end of the sapling to which the eye-bolt is attached is at its shortest distance from the waterhole the cask is at the bottom of the waterhole being filled, and when at the greatest distance from the waterhole the cask is discharging its contents into the wooden tank in the brace.

The cask is fitted with a trapdoor in the bottom, thus enabling it to be rapidly filled, and is kept in its place by the two sapling supports and two guide-irons running through the pivots of the ironwork on which the cask is hung. The cask empties itself into the tank on the brace by one edge of the

cask catching on a loosely tied stick projecting over the side of the tank, thus tilting up the cask and emptying its contents. This is clearly shown in the illustrations where the cask is shown coming up full of water and also discharging. The whole cost of the plant, including the digging and slabbing of hole, erection of brace, wire rope, ironwork, &c., only amounted to £25. The water is raised 20 feet, and when the horse was going at a steady pace water was being raised at the rate of 5,000 gallons per hour.

IRRIGATION AT GYMPIE.

Mr. H. Fittell, Eel Creek, Gympie, sends us a description of a cheap irrigation plant worked much on the same principle as that described by Mr. Benson. In the former case there are two barrels at work, and the walking beam is provided with a wheel at each end. This, of course, allows of double the amount of water being raised in the same time. Mr. Fittell says that his plant can be erected for £20, and will raise 6,000 gallons of water per hour with one horse. There are a dozen of such plants working close to Townsville, and the results of the irrigation by their means are surprising.

BOUVARDIA.

By A. MARSHALL.

(Paper read before the Horticultural Society of Queensland, 19th November, 1902.)

The genus *Bouvardia* was named after Dr. Charles Bouvard, a director of the Botanic Gardens, Paris.

The species are evergreen shrubs, and with one or two exceptions are natives of Mexico.

The first species introduced into England was *B. triphylla* in 1794. It was followed by *B. versicolor* in 1814, and *B. longiflora* in 1827. *B. angustifolia* was introduced in 1838, *B. flava* in 1845, *B. Cavanillesii* a year later, *B. larantha* in 1850, *B. jasminiflora* in 1869, and *B. Humboldti* in 1874.

These species through cultivation and crossing produced a number of hybrids which are now in general cultivation. Hogarth produced in 1870 two varieties named *B. Davisoni* and *B. Freelandi*, and from which a number of our present varieties were raised; Alfred Neuner being a sport from *B. Davisoni* in 1872. This variety was raised in America, as was also President Garfield a year later.

In 1885 *B. Hogarthii flore pleno* was obtained by Messrs. Jacob Mackoy and Co. at Leige, it being a sport from Hogarth. This variety is one of the best for growing in our State, for, besides being a strong grower, it is a most prolific bloomer with large trusses of double red flowers.

Beauty of Brisbane, a locally raised variety, is a sport from Priory Beauty, and, in my opinion, is the pick of all the Bouvardias; it is a splendid grower, and its trusses of beautiful single white flowers are invaluable for bridal bouquets or for table decorations.

President Cleveland is a fitting companion to Beauty of Brisbane, its bright trusses of flowers making a splendid show. In the garden it has only one fault with me, and that is it is not so strong in growth as most of the Bouvardias.

Priory Beauty is another excellent variety with beautiful pink flowers; it is also a very strong grower, and good bloomer.

Bockii is a splendid grower, with large trusses of salmon flowers with a white throat. When well grown, this variety is one of the best for exhibition purposes.

Alfred Neuner, of which mention has previously been made, is, like *Högarthii flore pleno*, a double variety with pure white flowers. A very fair grower.

President Garfield is similar to Alfred Neuner; only its flowers are flesh pink.

The above six or seven varieties mentioned are no doubt about the best selection one could recommend for anyone wishing to grow the Bouvardia. All of them do splendidly with proper attention.

I have not mentioned a lot of varieties for the simple reason that, like growing roses, when you find you have a good selection and have room go in for duplicating your varieties, instead of getting a great many sorts which will not give you near the same results. If anyone wishes to grow, say, a dozen varieties all they need do is to get one of the southern nurserymen's catalogues, and they will find a large number to select from. There is one variety I should like to hear of, and that is a good yellow, both growing and flowering.

In cultivating the Bouvardia, one sees it recommended by some professional men to plant between roses, &c. Now, I do not hold with that at all. If that method is tried I am afraid a great many amateurs will soon give up its cultivation, as it is like growing a mass of other plants, such as carnations and annuals between your roses, which certainly will have the effect of making your garden look gay, but which will not do justice to either the Bouvardia or the rose. By all means give them a bed to themselves, so that you will be able to feed and look after them, and the result will well repay you. In planting out, try and get them a sheltered position, that is, where they will only get the morning sun through summer up till about, say, 10 or 11 o'clock, or else plant out in the open and erect a shade over them with a light covering of boughs. These boughs can be easily removed during the winter months, when the Bouvardia likes all the sun it can get. I might say that I am adopting this plan myself, and I feel sure I will have good results, as the shade will be just sufficient to break the heat of the sun from making the flowers droop or burn. Before planting you must drain well, as you never will be successful without proper drainage, especially if you happen to have a stiff soil; in fact, I do not think the Bouvardia will do at all with you unless you have an open soil.

I had good proof of the effects of drainage with Bouvardias some years ago. One of our members, Mr. T. Burns, had a piece of land on Spring Hill filled in with stones and soil, and well sheltered from wind and sun, in which he planted Bouvardias. These attained a height of about 7 feet, from which he was constantly cutting flowers. I think this was the best show of these flowers that I had or have seen; in fact, it was seeing them do so well that induced me to go in for growing them myself.

There are two ways of propagating the Bouvardia—by planting branch, and root cuttings; the latter being by far the simplest and most likely way to give the best results. All that is needed is to take your root cuttings any time during the month of August—they need not be too thin or too thick, say about the thickness of a darning needle, and about 3 inches in length; place them round the edge of a 5 or 6 inch pot in sandy soil, and be careful in watering not to let them get too dry nor rot them off by a too liberal use of water, but try and keep them, if possible, in an even temperature, when you will find fully 90 per cent. will grow.

In October and November you will be able to transplant them into small pots, and when established into the place you want them to grow.

During dry weather water freely and give them a good top dressing of well-rotted manure.

In conclusion, in speaking to some flower-growers they have the impression that the Bouvardia is difficult to grow. I do not think they could make a greater mistake, for, as I before stated, if you only start growing it by having good drainage you will find it far easier than you imagine.

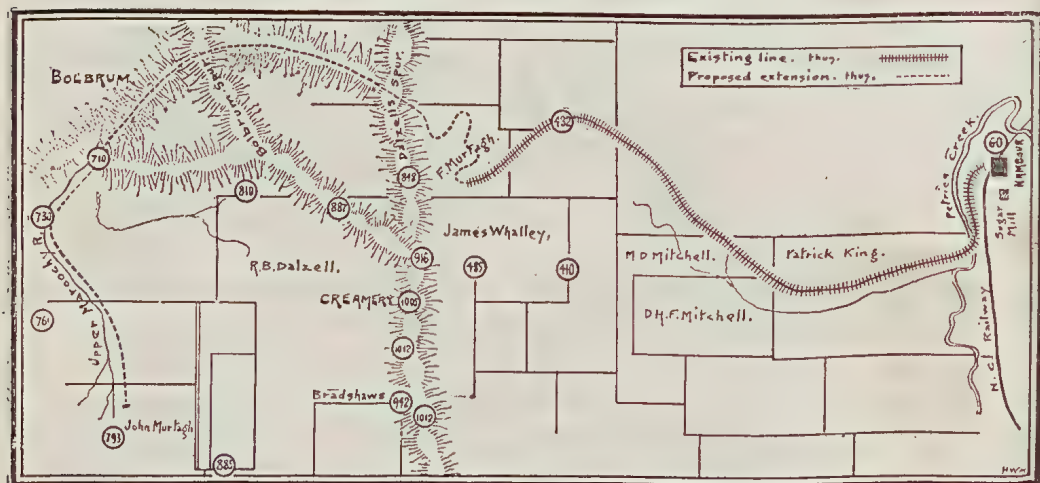
ASPARAGUS.

More attention should be paid to the cultivation of this most desirable vegetable, and to those desirous of cultivating it upon a large or small scale perhaps the following notes may be of interest:—

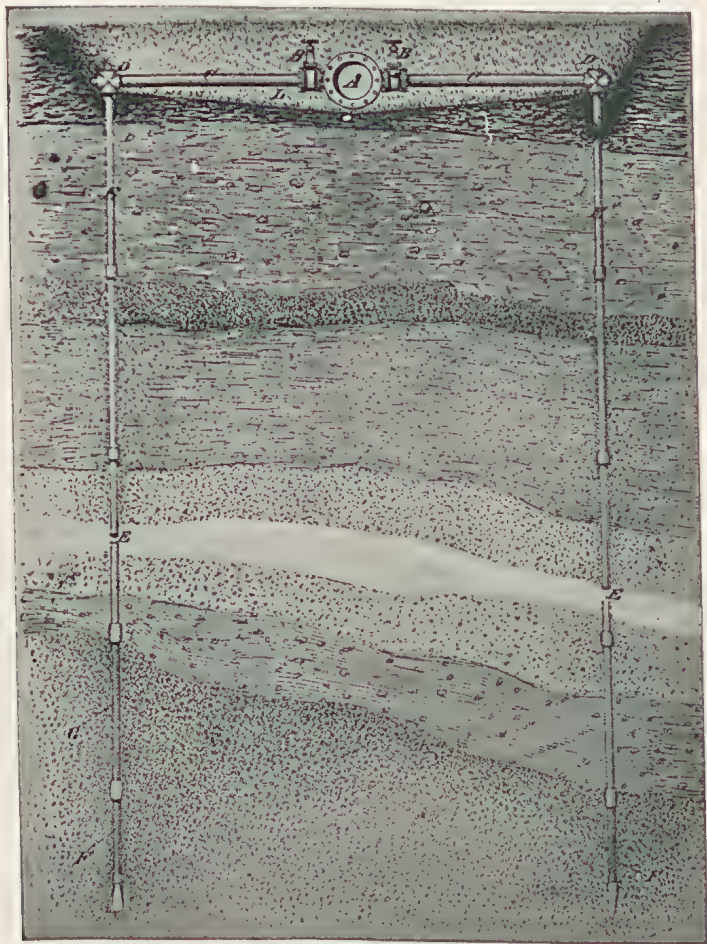
The soil best suited for it is a rich sandy loam, although it will thrive upon heavier soils, as is the case at Bathurst Farm, it being grown upon rather a heavy clayey loam made friable by applications of well-rotted stable manure. The land should be trenched from 2 to 2 feet 6 inches deep, and thoroughly mixed with well-rotted manure.

To save time it is better to purchase strong shoots which have been raised from seed two seasons previously. If raised from seed it would be the fourth season before strong heads would be produced for cutting. The beds are thoroughly prepared during the winter for the reception of the roots towards the beginning of spring, for if planted too early a number are apt to die. The beds should be 4 feet wide, with paths about 2 feet between, to allow of cutting without treading upon them. Two drills should be opened upon each bed from 18 inches to 2 feet apart, and the roots carefully spread in them about 1 foot apart, and the crowns covered by about 2 inches. Care should be taken not to expose the roots more than is necessary. The beds are then neatly raked over and a top dressing of coarse salt applied, which is washed in by the rain. If strong roots were planted, a cutting could be made the second season after planting, which would be in about fifteen months. The old method of cutting the young shoots several inches below the surface has given place to the method of allowing the shoots to grow from 5 to 6 inches high, which are then cut off level with the beds; this allows of the whole of the shoot being eaten, instead of only a portion as by the former practice, and prevents injury from cutting other shoots below the surface. No stems should be allowed to grow during the cutting season, which should last from six to ten weeks, according to the vigour of the roots. If continued too long, the plants would be considerably weakened. After this they should be allowed to grow, in order to store up nutriment in the root and give out shoots the following season, and should be kept free from weeds and receive liberal treatment with liquid manure and salt throughout the summer. After the stems have turned brown in the autumn they are cut close to the bed and removed; the beds are carefully forked over and given a good dressing of well-rotted manure several inches in thickness. In the early spring the beds are again forked lightly over, tidied, and a dressing of salt applied. If carefully tended, the beds will remain productive for many years.—*Agricultural Gazette, New South Wales.*

THE NAMBOUR-DULONG TRAMLINE.



The reader is referred to page 2 for an explanation of this plate.



A TUBE WELL INSTALLATION, SHOWING TUBES DRIVEN THROUGH VARIOUS STRATA.



Tropical Industries.

IRRIGATION ON THE BURDEKIN DELTA.

Notwithstanding the fact that the Far North of Queensland is the best watered portion of the State, evidences of the dire results of the late drought are painfully apparent in many parts of the Northern districts. The numerous long rivers and their tributaries shown on maps and plans exist, in many cases, merely on paper, except during the wet seasons, when their beds are filled to overflowing until the cessation of the rains. The so-called rivers then shrink to a succession of waterholes. During a protracted dry season these waterholes gradually dry up, and as the drought becomes more severe the sources of supply, if there be any, fail. Then the native grasses begin to disappear, and cultivated lands wear an appearance of desolation. As time goes on and no life-giving showers fall, the general desolation becomes more apparent, for not only do cultivated trees die out but the native timbers are likewise affected over large areas. From want of grass and water, cattle, sheep, and horses either die or drag out a miserable existence, their owners expending large sums in the hope of keeping a remnant of their stock alive until the return of good seasons.

Such has, unfortunately, been the experience of Queensland, where the most terrible drought known in the history of the State has held sway for a lengthened period, extending, with slight intervals, over six years in the West and over eighteen months on many parts of the coast. During many years farmers have trusted to the natural rainfall to produce their crops of sugar-cane, cereals, grasses, &c., and have consequently lost heavily during the occasional dry seasons. There were some, however, who were not so trustful. They turned their minds to the subject of irrigation. If constant supplies of water suitable for irrigating crops could be discovered, losses from drought would no more have terrors for them.

Naturally, such men turned their attention to the rivers and lagoons as a source of supply, and the result was that irrigation plants—in some cases, enormously costly—were installed on the banks of the rivers. The fields were irrigated from these sources, and the crops thrived. The men of small means, however, had still to battle with the seasons, being unable to find the necessary capital to purchase engines and pumps, erect flumes, and carry the water to their farms, which, in many cases, were situated many miles from a river.

As a permanent source of supply, the surface water contained in the rivers and lagoons is by no means to be relied on. Such sources, unless fed by springs supplying as much water as is removed by evaporation and by the requirements of man, or unless they are constantly renewed by regular rainfall, must, in the nature of things, eventually dry up, and with their failure heavy losses in various ways are entailed upon all whose means of livelihood depend on a continuous water supply.

Attention was consequently drawn to the possibility of the existence of underground supplies on the coast lands. It had long been demonstrated by means of artesian bores that vast quantities of water exist in the State at great depths in certain strata, but artesian water was not available for cane-growers and farmers on the coast lands for two reasons: First, the great cost of such bores; and, next, the absence of water-bearing rocks on the coast.

Scientific men had, however, conclusively demonstrated that enormous quantities of subterranean water are constantly running into the sea along almost the whole coast-line.

Now, as this fresh water is obtainable by merely digging in the sand even below high-water mark, the inference was that it could be obtained at no great depth on the great deltas of our large rivers.

On trial being made, this was found actually to be the case, and the sinking of wells was carried on by farmers, who were thus rendered independent of the natural sources of supply—viz., the rivers, lagoons, and the rainfall.

Still the problem of growing good crops in a dry season was not yet solved. Even when copious supplies of water were met with in the wells, the cost of raising it in sufficient quantities to irrigate even small areas of land was prohibitive.

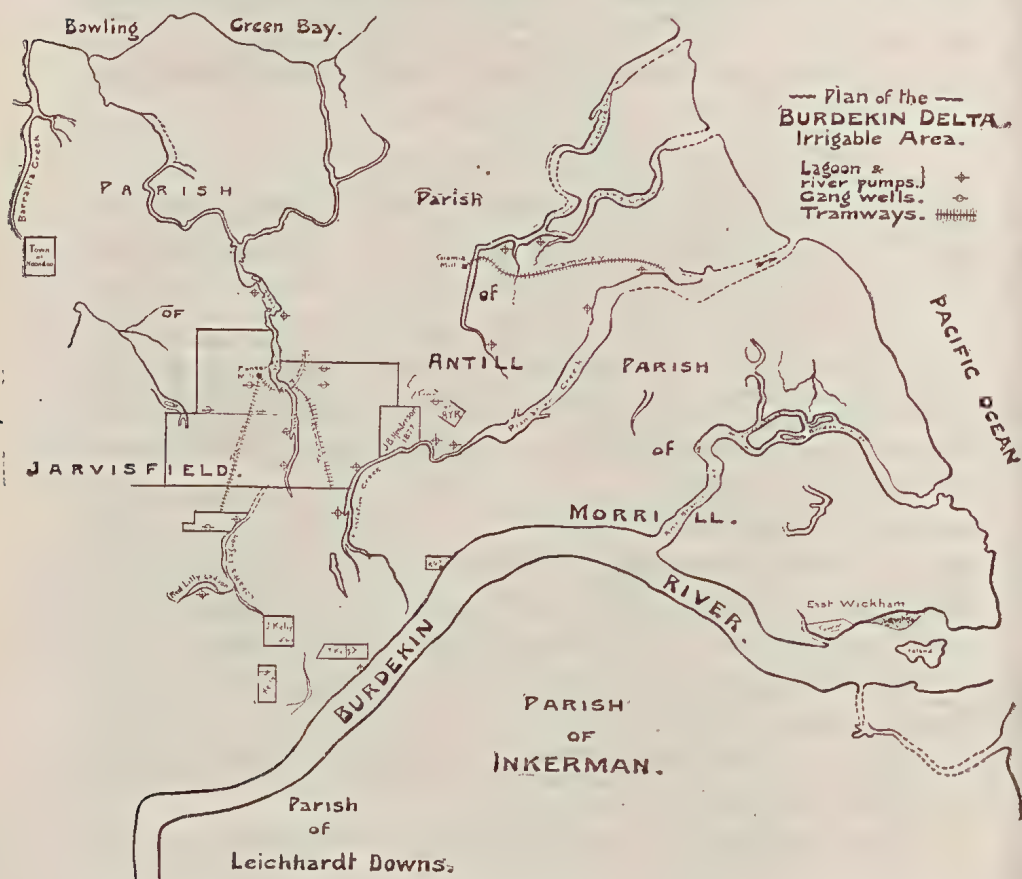
But science and, indeed, ordinary intelligence were destined to satisfactorily solve the problem.

As a telling example of the triumph of mind over matter, I will take

THE IRRIGATION AREA OF THE BURDEKIN DELTA.

Every schoolboy knows or ought to know what a delta is. Nearly all large rivers enter the sea by several mouths. Some of the branches of the terminal course of a river are almost as large as the river itself. They enter the sea at points often widely separated from each other. The land between these branches is the delta, usually in the form of a triangle and deriving its name from that of the fourth letter of the Greek alphabet, which is in the shape of a triangle.

As rivers have often changed their course during past ages, particularly in level country and towards the coast, it follows that the original branches forming the delta have taken another direction, leaving their former beds bare, and in this manner the level land at the estuary has been from time to time increased in area, its level raised by the sedimentary deposits during successive floods, and is often traversed by small anabranches of the river which serve a useful purpose for water carriage. Baratta Creek, Sheep Station Creek, Kalamia Creek, and others have doubtless at some previous period of the world's history been anabranches of the main stream. Such is the delta of the Burdekin. This is one of the if not *the* largest of the rivers in the North, exceeded, perhaps, by the



Fitzroy, the total watershed of which comprises 55,603 square miles, whilst that of the Burdekin is 53,529 square miles. But the length of the Fitzroy proper is only 180 miles, whilst the Burdekin runs a course of 425 miles before entering the sea at Upstart Bay.

Here the river runs by several branches into the Pacific, and encloses an area of about 600 square miles of perfectly level country, consisting of mangrove flats and salt pans close to the coast, and changing to great stretches of splendid alluvial soil of considerable depth overlying a fine loamy sand at a distance of from 2 to 15 miles further inland.

The lie of the country renders it exceptionally well adapted for perfect irrigation.

The country was first taken up about the year 1877 by Messrs. J. B. Henderson, MacMillan, Dick, McIlwraith, and others, and the soil being found admirably suited to sugar-growing, plantations were formed; and as time went on, land was taken up by the farmers, some was bought outright from private owners, and much was taken on lease from the proprietors of the large plantations, such as the Pioneer, Kalamia, Seaforth, Clondyke, Airdmillan, &c. The first-named estate comprises 9,000 acres, of which 1,200 acres are under cane. The labour employed consists of 72 Europeans, 260 kanakas, 60 Japanese, and 30 Chinese—a total of 422 labourers. The sugar made at the Pioneer Mill in 1889 amounted to 5,200 tons; in 1890 7,500 tons were made. In 1891 3,750 tons was the output, and in 1902 3,500 tons were made. The whole of the cane growing at the time of my visit looked green and flourishing, and gives promise of a large crop for next season. The same pleasing picture meets the eye everywhere for miles round the country. Yet not 5 miles away may be seen large areas of stunted cane, dried up to the very roots with no hope of recovery from the effects of the drought. The reason for this anomaly is simple—the dried-up fields have been left to Nature to obtain the moisture so vitally essential to growth, whilst the richly clothed fields have been abundantly irrigated.

THE SOURCES OF WATER SUPPLY.

As I have already pointed out, there are three sources of supply—the river, the lagoons, and the underground water. Some years ago two engineers proposed a scheme for bringing water for irrigation purposes from the "Rocks," about 20 miles from Ayr, by means of flumes and main ditches, totalling 60 miles in length.

The cost of this work was estimated at £150,000, and would probably have run into £250,000. Had this scheme been carried out, the money would have been absolutely wasted, especially during such a season as that of 1901-2, when during the latter months of 1902 the total quantity of water coming down the river amounted to only 300,000 gallons in twenty-four hours. The absolute uselessness of such a scheme is now plainly shown by the fact that water was to be brought from a distance of 20 miles to the spot where the very same water lay at a depth of only 16 feet.

It will be observed that I am taking the Ayr district as typical of this particular country; hence there will be no need to describe the whole delta—*e uno disce omnes*. Readers may judge of the rest by this one district.

It was my good fortune to meet Dr. Walter Maxwell, Director of Sugar Experiment Stations, who was visiting the district, accompanied by three gentlemen from the Isis, Gooburrum, and Mount Bauple, and who were invited by him to investigate the systems of irrigation obtaining on the Burdekin, and to consider how far the same system could be applied to the canefields of their respective districts. The Doctor courteously permitted me to accompany the party from Townsville to Ayr.

What I am now about to describe is partly what came under my own observation, and partly what I gathered from the scientific observations of Dr. Maxwell.

On arrival at Ayr, about 60 miles from Townsville, a meeting was held by the expert and the delegates, when a systematic course of investigation was arranged to cover the next few days.

It was proposed to first examine the River Burdekin with a view to deciding whether it could be looked upon as a reliable source of water supply. Then the lagoons would be visited to ascertain if a satisfactory and permanent supply could be depended upon from them. Finally, the question of an underground supply would be considered. The next step would be to look into the means of getting at this supply, at what depth, and by what means it could be raised. Then the matter of pumps would be gone into, inasmuch as they are employed on large plantations, by small farmers growing cane on their own account, or by a combination of farmers on the co-operative system.

Dr. Maxwell pointed out that the great object of the Southern visitors coming to the Burdekin was to find out how far the conditions under which a water supply is obtained on the Burdekin delta coincide with the conditions in other districts further South, such as Mackay, Bundaberg, and the Isis. All this would be made clear during the visit. In the Bundaberg district there was a plentiful supply of water, whilst in the Isis there was no such supply, or at least there was only sufficient for a few small farmers. Much depended upon the height of the land above sea-level. In any case the whole question depended upon how far the Burdekin water supply conditions could be modified to suit other districts.

At Gooburrum the height of the land is 70 feet above sea-level, and a good supply of water could be got there. It would be best, the Doctor said, to bore in that district, as, if a well were sunk, it would be possible to lead the water away into another stream. He said that at Mackay samples of every stratum passed through in sinking a trial bore were preserved. A water-bearing stratum was struck at 18 feet, consisting of sand and gravel, and, at 40 feet, 3 feet of water-bearing strata were reached, giving a splendid supply. At a further depth of 20 feet, a still better supply was obtained from a stratum 5 or 6 feet thick, which now supplied the town.

As far as a river supply is concerned, it has been set forth by the Director of the Sugar Bureau that not one single river in Southern or Central Queensland can be relied upon for a constant and regular supply of water.

THE BURDEKIN RIVER AS A SOURCE OF SUPPLY.

The first place visited by the delegates from the South was the Burdekin River, 5 miles from Ayr, at a point 15 miles above tidal water, on 18th November. The banks are 40 feet high, and the width of the river 50 chains. On the date mentioned, the stream of water passing down on the left side of the river bed was 4 feet wide and 2 inches deep, and the velocity 6 inches per second, equal to about 300,000 gallons in twenty-four hours. In a normal season, the flow would have been about 2 feet per second.

An inch of water per acre is equal to 22,000 gallons. Now, to properly irrigate a field of 50 acres of cane, from 2 to 4 inches of water are required every fortnight. I will take the mean, and say that 3 inches are required for each acre. This amounts to 66,000 gallons, so that to irrigate 50 acres 3,300,000 gallons would have to be regularly drawn from a river which, in such a season as the past, when the crops are continually demanding moisture, can only furnish less than one-tenth of this quantity, and that only for a small area of 50 acres. To properly irrigate 200 acres, 5,000 gallons of water a minute, or 7,200,000 gallons, would require to be raised in twenty-four hours. Of course when a large body of water is coming down the river, the quantity could be obtained, but in dry seasons such as often occur in the Burdekin district, which lies in a dry belt, the supply could not be depended upon. Hence it is perfectly obvious that, as a permanent reliable source of supply, the river is not to be depended upon.

This matter being decided, the next item on the programme, as above laid down by Dr. Maxwell, was to consider.

THE LAGOONS AS A SOURCE OF SUPPLY.

In the parishes of Jarvisfield and Antill, on the north side of the Burdekin River, some of the creeks expand into wide, deep lagoons of considerable length. Thus, the Red Lily Lagoon near the water reserve is over a mile long and of considerable width and depth. La Batt's Lagoon, which is practically a continuation of the Red Lily Lagoon, is about 3 miles in length, carrying good stretches of deep water. Sheep Station Creek opens out into a series of lagoons from 2 to 3 miles in length. Lilliesmere Lagoon, 4 miles in length, is a portion of Kalamia Creek. The lagoon at the pumping station on Plantation Creek is 20 feet deep in parts. Of course the deep water in these lagoons is not continuous, stretches of shallow water intervening, and a dense growth of magnificent pink lilies covers large portions of them. Wild ducks, geese, herons, and pelicans abound everywhere, and flocks of native companions may be seen playing on the canefields. No shooting is permitted on any of the sugar estates.

These lagoons are all on the north side of the river, and have a north-easterly trend. Now, as I have said above, unless a lagoon is fed by underground water, it must eventually fail when large quantities of water are being drawn from it. Unless so fed, a serious danger is to be apprehended. The land being barely above sea-level, when the superincumbent pressure of the fresh water is removed, the resistance of the remainder will be overcome by the tidal water, distant less than 12 or 14 miles, and instead of fresh water, first, brackish, and subsequently, if pumping operations are continued, salt water will enter from below, and when that occurs the lagoon ceases to be a source whence water suitable for irrigation purposes may be drawn. This irruption of salt water not only has the effect of spoiling whatever fresh water may be left, but the sea salts are absorbed by the material composing the bed of the lagoon and continue for a lengthened period to exercise a baneful influence on the fresh supplies of rain water which restore the water to the lagoon.

It was apparent, however, in one two localities that underground water was flowing into the lagoons, which in such cases perform an office similar to that performed by the glass water gauge on a boiler. The level of the lagoon water is indicative of the level of the underground water.

It would thus appear that, as a reliable source of supply, lagoons which are fed by underground water, and whose volume is maintained by an influx during the night of a quantity of water equal to the amount pumped up during the day, may be favourably considered. When such fresh supplies are not equal to the full demand, either the minimum quantity needed for irrigating the crops must be withdrawn, or, if the maximum quantity be pumped up, the supply of water will become daily less until, if the lagoon be situated in a locality which can be reached by the tidal water, the pressure of the fresh water will be insufficient to withstand the infiltration of salt water, with the result that the remaining fresh water is impregnated to a dangerous extent with sea salts, and these solids are then deposited in the bed of the lagoon, rendering subsequent supplies of fresh water unfit for irrigation purposes.

In many instances the farms are situated at a long distance from the river and from the lagoons. Such farms, under severe drought conditions such as have of late years prevailed, must either be thrown out of cultivation, or means must be found to irrigate the fields. Surface water being unavailable, search must be made for

UNDERGROUND WATER AS A SOURCE OF SUPPLY.

In the United States, when farms are taken in such localities that no surface water is available, the first thing a farmer does is to sink a well. It is usually the last thing the Queensland farmer thinks about. Some ten or twelve years ago the farmers at Pittsworth sank several wells to a considerable depth to obtain water. In several places no water was found, and the conclusion was that none of any extent existed. I, in company with some others, in prospecting for coal, put down a shaft not far from some of these

wells, and at about 60 feet struck such a great body of clear, fresh water that constant pumping with an 8-horse power engine failed to reduce it in the slightest degree. That shaft has been furnishing good supplies of water all through the drought. It would thus appear that underground water inland may be traversed by some impermeable stratum which limits the area of supply. When we come to consider the enormous quantities of water which rush down from the mountains, soak into the soil, and disappear in the beds of the rivers, it is only natural to conclude that this water must find an outlet somewhere, and that this somewhere must be the ocean. But, to reach the sea, it must pass beneath the surface of the earth at depths decreasing in proportion as the distance from the mountains increases, until finally it emerges at sea-level. In the meantime it has permeated to saturation point the subsoil of the great deltas of all the coastal estuaries of the rivers.

Of these deltas the most extensive is that of the Burdekin River between Townsville and Bowen. Here then, beyond the reach of tidal waters, it would be expected that a considerable area of underground water would be found. For many years nothing was done in the way of prospecting for this water, as the river and the lagoons carried ample supplies for the large sugar estates, and the smaller growers depended entirely on the rainfall, which in this dry belt of country is intermittent and uncertain. The occurrence of the great drought, however, made it absolutely necessary to devise some means of irrigating the small farms, if they were not to be wiped out of existence.

In this emergency Messrs. Drysdale Bros., proprietors of the Pioneer Plantation, came to the rescue. They proved the existence of large and apparently inexhaustible supplies of excellent water by means of tube wells driven through the soil at a depth of from 16 to 20 feet. The result has been that within the last year a great many pumping stations have been formed all over the at present exploited irrigable area of the delta. These pumping stations cost from £200 to £1,200, according to size, &c.

It may easily be understood that struggling farmers might not be in a position to afford such a large outlay, and many, although now aware of the precious supplies of water close to their feet, preferred to still trust to possible rains to assist their crops rather than run into debt for machinery which would enable them to produce such crops as would pay for that machinery in one or, at most, two seasons.

So impressed were the Messrs. Drysdale Bros. with the urgent necessity of saving the small cane-growers from the inevitable ruin which stared them plainly in the face, that they offered to supply the latter with engines, pumps, and all necessary irrigation appliances at cost price, landed at the Burdekin.

Meanwhile they had been supplying their tenants with water from their lagoon pumping stations, thus enabling them to irrigate from 25 to 50 acres of cane each. There are about forty of these tenant farmers. Those who received water from the Pioneer pumping stations paid 10s. per acre to have their crops thoroughly irrigated.

Now, before describing these pumping stations, I shall say a few words on

THE JUDICIOUS APPLICATION OF WATER TO THE FIELDS.

The finding of sufficient or over-abundant supplies of water suitable for irrigation and the installation of pumping gear are only the first steps in the business. Now the *science* of irrigation must be brought into play.

As soils and subsoils vary in depth and texture, so is it necessary that *the quantity of water applied to the soil must be varied*.

If we have a heavy surface soil with a stiff subsoil on one portion of an estate, and on another portion a light sandy loam above with a porous subsoil of sand or gravel, it must be obvious that the application of an equal amount of water to both these areas is wrong in principle.

Suppose we apply 66,000 gallons to the acre on the heavy land, and the same quantity on the light land, what is the inevitable result? We convert

the heavy land, in the course of time, into a bog; whilst, on the other hand, we leach all the best constituents out of the light soil—in both cases to the detriment of the crop. This has been most fully demonstrated in the United States, where entire farming districts have, by unscientific irrigation, been converted into malarial swamps, and the farmers have had to abandon their holdings.

On the Burdekin delta it was seen by Dr. Maxwell that, owing to a want of knowledge of the first principles of irrigation, vast quantities of water were used to flood the canefields, and, had the waste and certain damage to the fields not been pointed out by him, serious loss must have eventually occurred. So convinced were the Messrs. Drysdale of the correctness of this view that on one plantation, Clondyke, managed by Mr. F. Radcliffe, where two engines and two powerful centrifugal pumps were each pouring 5,000 gallons per minute over the fields, that is, 7,200,000 gallons in twenty-four hours—one engine was stopped, with the result that even better results were got by the use of one pump only than if both had been running. In this case science saved not only a loss of over 7,000,000 gallons of water per day, but the eventual loss of the best constituents of the soil by leaching was prevented.

HOW THE BURDEKIN LANDS ARE IRRIGATED.

I will now describe the latest style of irrigation adopted on the delta by the farmers. Since the discovery of underground water, it has become a maxim with them that they will cultivate no lands which cannot be irrigated.

Those who have river frontages naturally use the river water as far as it will go.

Those on the lagoons make use of the lagoon water, and both employ the same means to raise the water to a sufficient height to enable it to travel along flumes, races, and ditches till it reaches the canefields, where it is allowed to run down between the cane rows in furrows till the whole of the field has been laid under from 3 to 4 inches for old cane and 1 inch for cane which has not yet started to make joints.

It should be noted that the soil of the delta generally consists of about 2 or more feet of rich, dark, porous, sandy loam. Beneath this is a porous subsoil still sandy, and lower down the subsoil is of compact sand. Such a soil, it is evident, can be irrigated without water-logging, and, if irrigated with judgment, without leaching to any great extent. At Fairymead, Bundaberg, a clay subsoil is reached at 2 feet depth. Obviously the same quantities of water could not be applied in both cases.

The means employed for raising water from the river and from the lagoons are the same—viz., a Robinson's centrifugal pump, and an engine of from 20 to 4 h.p. The water is pumped and forced to various heights, none exceeding 50 feet. It then either enters a flume direct or it is pumped into a dam, whence it is conveyed by a race to the heads of the fields, and thence along the furrows until the whole has been thoroughly soaked.

The underground water is raised in a different manner.

A site having been fixed upon, a trial tube is driven down by means of a simple hand pile-driver. The manner of driving these tube wells, which were largely used with great advantage by Lord Napier in the Abyssinian expedition, is so well understood by most people in rural life that it scarcely needs describing. The tube is simply a 2-inch pipe with a galvanised steel point, above which there is a perforated brass strainer. As stated, the tube is driven into the ground by the pile-driver, and when it has been forced into its full length a second tube is screwed on to its head, and driving is continued until the desired depth—that is, the water—is reached. The connection between the tubes must be perfectly air-tight. It often happens that underground streams are formed one above the other, as shown in the illustration, which is taken from the *Scientific American*, and was kindly lent to me by Mr. J. B. Henderson, Hydraulic Engineer. This formation occurs in all districts similar to that

under present notice, and it shows the great advantage of tube wells over the ordinary open well, in that the tube may be driven entirely through one or more streams of water to take its supply from a source which may be deemed still more desirable yet lower down. In the pumping station illustrated, many of the driven wells are made to take water from two or more of the underground streams by the interposition of lengths of tubing with openings and strainers at heights corresponding with the channels of the streams.

Water having been found in the trial tube, a long pit is dug about 10 feet deep and from 100 feet to 200 feet long. Then tubes are driven down to the water about 10 feet apart. There is a double line of these tubes, as shown in the illustration. The two lines of tubes are separated by either 2 feet or 4 feet, according to the nature of the connection. Usually, there are from twelve to sixteen tubes in a line, making a total of from twenty-four to thirty-two wells. Between the lines of tubes runs an 8-inch iron pipe, or perhaps a larger one. All the tubes are connected with the pipe either by cross tubes or by a bent connection, which allows the tubes to be only 2 feet apart. Thus all the water is brought to a common centre by means of a Robinson centrifugal pump, fixed at the centre of what is called the area of collection. The engine—usually an 8 h.p.—is placed on the level ground above the opening, and drives the pump gear by a pulley and belt. On the opposite bank is a flume with a box head into which the delivery pipe leads. The pumps vary in size from 15 inches requiring a 20 or 30 h.p. engine to a 4-inch with a 6 h.p. engine.

When the work begins, a vacuum is formed in the main pipe, and the whole of the water from the twenty-four wells is drawn to the common centre, whence it is forced up into the flume to pass on its journey to the fields.

A RIVER PUMPING STATION.

Mr. E. Gibson, who owns a farm of some 160 acres on the Burdekin River, about 4 miles from the township of Ayr and 6 miles from the Pioneer mill, has, within the last four months, installed pumping machinery on the river. As he said, it was either go in for an engine and pump or get no crop. It will be remembered that the river at this time was a mere 4-feet wide and 2-inch deep trickle; but Mr. Gibson has cut "grips" in the river bed, and so has collected sufficient water to keep his crop fairly well irrigated. He has a 6 h.p. vertical boiler and a 4-inch centrifugal pump by which the water is lifted 14 feet and forced to 38 feet. The 4-inch pump discharges the full 6 inches of the discharge pipe, a fact easily accounted for, as the discharge is on a steep incline; consequently the pipe is always full, as the water comes twice as fast from the pump as it travels up the pipe.

Two acres a day are irrigated. One portion of the land cannot be irrigated with present appliances, owing to a rise in the land; and this emphasises the fact that, except under special conditions and contouring rises, ridgy land does not lend itself to irrigation.

The irrigated crop of 12 acres, planted in September last, looked beautifully green and was growing rapidly, promising a bountiful return. With the aid of two men he could irrigate 5 acres per day, and 40 acres in all with the present small plant.

Having subsoiled the land to a depth of 15 inches, it gets a preliminary soaking. After the cane is up it gets a good watering, and two days later a thorough soaking, the work occupying fifteen hours. The actual cost of this plant, including Tangye engine, boiler, pump, and piping, was £101.

Some sorghum, seven weeks old, was a magnificent crop, promising 60 tons per acre. It was 8 feet high, and formed a dense mass of heavy flag.

This is the only plant in the delta pumping directly from the river. The yield of cane is expected to be fully 50 tons and more probably 60 tons per acre. This should bring in at least £350. Thus, for an outlay of £101, a threefold yield will be obtained which, deducting working expenses, should go a long way towards paying for the outfit.

LAGOON PUMPING STATIONS.

KALAMIA.

Here there are 12 pumping plants, the largest having a 15-inch centrifugal pump and a 20 h.p. engine, costing £800. The smallest has an 8-inch pump worked by an 8 h.p. engine, raising 1,250,000 gallons in 24 hours, and costing £500. The main pumping station is on Lilliesmere Lagoon, where a 15-inch Robinson's centrifugal pump is worked by a 20 h.p. portable engine. This lagoon is fed by springs, and, although it has been used for twenty years, has never failed. When pumping ceases for the night, the lagoon rises 1 foot. It is really the old bed of the river, and is situated at about sea-level; hence, if the lagoon were by any chance to give out, the tidal water would probably come in, with the result I have already shown.

The pump raises 5,000 gallons per minute or 7,200,000 gallons in twenty-four hours, and this serves to irrigate 200 acres. The plant is, however, capable of irrigating 600 acres if sufficient water were available. Owing to the uncertainty of rain, the pump is only worked at half its capacity.

CLONDYKE.

The lagoon here (Plantation Creek) is 13 miles above tidal water, and is 20 feet deep in the centre. Work has been going on here for five years, but no perceptible reduction of water has taken place. Still the full power of the pump is not employed—*i.e.*, 10,000 gallons per minute—as it is feared that good rains may not occur before January.* The 15-inch pump is driven by a 40 h.p. engine.

A little while ago two engines and pumps were employed here to irrigate 500 acres, but Dr. Maxwell pointed out that quite half the water was needlessly applied and consequently wasted. One of the pumping stations was, consequent upon the advice, taken away, with the result, as stated by the manager, Mr. F. Radcliffe, that better results were obtained in the matter of growth of cane by the use of one pump than by that of two. If this plant were to work day and night, 900 acres could be properly irrigated. As it is, it only works ten hours a day, and 50 acres a week are regularly flooded. At first over 1 foot per acre was put on at each application, which Dr. Maxwell showed was six times more than was needed. Only the open soil saved the cane from turning yellow under this enormous excess of water. For regulating the water on the field, seven men are required for 10 acres.

MAIDA VALE

is on Sheep Station Creek. The pumping installation here consists of a 10-h.p. engine, and a 10-inch centrifugal pump, drawing 3,000 gallons per minute, and supplying 250 acres of cane at present. The lift is about 30 feet, and the flume and race 7 chains long, the flume itself being 200 feet in length. The waterhole falls 6 feet during the day, and rises 3 feet at night. The depth has fallen from 30 feet to 20 feet.

DICK'S LAGOON.

This is the oldest pumping plant on the Burdekin, having been working for over eighteen years. The 12-inch pump sends a flow of water 18 inches deep a distance of 5 miles in open drains 5 to 6 feet wide at the top, and wider where the flow is very gentle.

LA BATT'S LAGOON.

Messrs. Payard and Hay have here an 8 h.p. engine and a 12-inch pump. The lagoon is a very large one, and is not likely to run dry, especially since heavy rains must now have filled all the creeks and lagoons. The irrigated cane here, as on all the other farms, looks remarkably well.

* Since the above was written good rains have fallen, and thus all fears of a short supply have been dispelled.—Ed. Q.A.J.

TUBE OR GANG WELL IRRIGATION.

I have already described the method of installing a tube-well plant.

One of these has just been put down near the Pioneer Mill, and a continuous supply of 180,000 gallons per hour of splendid clear water is obtained. There are thirteen pumps of all kinds on the plantation, from which the cane-fields are irrigated by means of 36 miles of flumes and races. Amongst those are one 15-in. Robinson Bros. centrifugal pump and a 20 h.p. engine pumping 300,000 gallons per hour; one 12-in. centrifugal pump and 16 h.p. engine pumping 180,000 gallons per hour; one 10-in. centrifugal pump and 12 h.p. engine pumping 120,000 gallons per hour; and one 8-in. centrifugal pump and 8 h.p. engine pumping 60,000 gallons per hour. Thus a total of nearly 16,000,000 gallons is being poured over the cane-fields of this one plantation every twenty-four hours from these four plants alone, and there are nine other installations constantly at work. In the irrigated area there are thirty pumps of various kinds.

Amongst these is that of Messrs. Carter and Soper. Here there are twenty-two 2-inch spear pipes driven to a depth of 28 feet, the water rising over 7 feet in the pipes, whence it is raised a further height of 12 feet 6 inches to the top of the flume, or a total lift of 31 feet. The pipes are 2 feet apart, and are connected with the main horizontal 6-inch pipe, 120 feet long. A 12-inch centrifugal pump draws all the water from the area of collection to the central delivery pipe, 8 inches in diameter. This installation cost about £500, including the 8 h.p. engine and all appliances. The flume, constructed of a series of connected zinc troughs supported on simple trestles on single piles, is a quarter of a mile long.

In this connection, it may be mentioned that in Hawaii many flumes are 4 miles long, and they are used not only for irrigation purposes, but also as miniature canals to carry cane to the mill. The canes are placed in the flume, and are rapidly carried to their destination. There is a considerable loss of juice, owing to the water diffusing it from the ends of the cane. So great is the loss that it has been estimated that it amounts to a value which would suffice to pay all the high salaries of the mill officers. By cutting the cane close to a joint, the loss is trivial.

Another irrigation plant here is that of Mr. R. Kelly of Ashgrove Farm, who irrigates 57 acres of cane by the spear-head method, lifting the water to a height of 50 feet by means of an 8-inch centrifugal pump and an 8 h.p. portable engine. Twenty-four spear-head pipes are driven down, and the water rises 13 feet in them. During working hours the water is lowered by 2 feet 6 inches daily, but this is made up by the inflow during the night. There are 60 chains of races carrying water to the fields. The plant was installed last May, and the results are highly satisfactory. The next crop of cane is estimated to yield from 40 to 60 tons of cane per acre. The total cost of the plant was £510. Putting the yield of cane at 50 tons per acre, this means a crop of 2,850 tons, and at the moderate estimate of 10s. per ton the gross value would be £1,425, which should pay for the plant, all working expenses, and leave a good net income for the farmer.

Mr. Kelly, junior, has a similar plant at no great distance from the former station. The water is struck at 16 feet from the surface, and is lifted and forced to a height of 21 feet. On this farm there are 100 acres under the plough. Mr. Kelly informed me that he had not taken 5s. worth of produce off the place last season. He would long ago have started irrigation but for a dislike to getting into debt, but with ruin staring him in the face he decided upon setting up an irrigation plant. The total cost was about £350, using a second-hand 8 h.p. engine, costing £170, and an 8-inch pump. The results have been so splendid that he expects to easily clear off the debt and have a handsome surplus next crushing season.

There are three brothers Kelly, who have all put down engines and pumps, the first being installed in May and the last in the beginning of November.

It is needless to describe any more pumping plants of this description, as they are all alike, and are all doing the same work.

There is no doubt that the installation of these pumps has been the salvation of the Burdekin farmers, not one of whom would now dream of cultivating land which he cannot irrigate. From all I heard from them they owe a deep debt of gratitude to Messrs. Drysdale Brothers for putting them in the way of raising heavy crops of cane. It now only remains for them to follow carefully the instructions of Dr. Maxwell, in order to preserve the fertility of their lands by proper cultivation and judicious irrigation, the latter being, for reasons already given, a most important point. To ignorantly soak the fields with too much water is to lay the foundation for ruin as surely as would have been the case had no water been available. As matters stand, the Burdekin farmers are amongst the most happily-situated of any farmers on the coast. They have any quantity of good land, plenty of water, money available to make use of it, and gratuitous scientific advice how to apply it. They have tramways right through their fields, and large mills capable of taking off all the cane they can produce.

From all I can learn, there is nothing to prevent the cane farmers on the deltas of the Pioneer River and the Burnett, together with doubtless that of the Herbert River, from following suit, water having been shown to exist in quantity at comparatively shallow depths, and the level land adapting it well for irrigation.

This is a matter which is now engaging the attention of Dr. Maxwell, and which will doubtless be brought to a practical issue ere long.

It must not be supposed from what has been stated about tube wells that they are a novelty. On the contrary, they were used in the Abyssinian expedition by Lord Napier of Magdala in the year —. I tried to use them at Forest Hill, Laidley, in 1881, but was foiled by the sandstone. The Hydraulic Engineer, Mr. J. B. Henderson, recommended them in 1892 for use on the Burdekin, and to the town council at Townsville for a water supply; and that gentleman says the installation of the driven wells proved a complete success.

I am indebted to Mr. Henderson for the photographs which are here reproduced, and which clearly show the method of installation of gang wells at the Burdekin.

SOME EXPERIMENTS WITH RUBBER-PRODUCING PLANTS AT THE KAMERUNGA STATE NURSERY, CAIRNS.

By HOWARD NEWPORT, Manager.

TABERNÆMONTANA CRASSA, BENTH.

The family of plants (Order Apocynaceæ) to which this species belongs may be roughly described as soft-wooded shrubs or small trees, with few exceptions not more than 8 to 10 feet high, bearing bunches of white or yellowish more or less sweet-scented flowers, and round fruit mostly in pairs and varying in size from $\frac{1}{2}$ -inch in diameter to 2 lb. in weight, and generally bearing prolifically.

The genus *Tabernæmontana*, named after James Theodore Tabernæmontana, of Heidelberg, a celebrated physician and botanist, who died in 1590, comprises, according to Mr. G. Nicholson, of the Kew Royal Botanic Gardens, some 110 species mostly of tropical habitat.

Of these, some fourteen or fifteen species would appear to be more or less popular as garden plants, owing to the sweet scent of the blossoms. The ordinary garden plant or shrub, in style of growth, in form of blossom, and in scent, is not unlike the *Gardinia*. In gardens in India one species (*T. coronaria*) is thought highly of, and is known there as the "Moonbeam" plant on account of the curious fact of the scent being much stronger and sweeter at night. In Queensland two varieties are indigenous, one of which, a comparatively small shrub, is fairly common in the tropical portions of the State.

The fact of several species of *Tabernæmontana* producing a milky fluid has been recorded. Of one species (*T. utilis*) it is stated that when tapped it yields a copious supply of thick sweet milk resembling that of a cow in appearance, but in substance rather sticky owing to the presence of caoutchouc.

While holding a place, therefore, in the list of rubber-producing plants, comparatively little would seem to be known about the rubber-producing properties of most of the *Tabernæmontana*. Reference to old reports upon the rubber-bearing plants and trees of Africa and other countries discloses but scanty and curt reference to any of this species.

In one report it is stated that a considerable portion of West African rubber is derived from the *T. crassa*; and in another instance it is stated (by Mr. R. L. Holmes, of Fiji) that the "Talotalo" (*Tabernæmontana Thurstoni*) was "decidedly our best rubber-yielding tree" (Fiji); but very little information as to method of extraction seems to be available, and only some three or four varieties seem to have been experimented with. The Fijian variety would seem to grow to large size.

A supply of small plants was obtained by the Department of Agriculture in July, 1899, from Thomas Christy and Co., London. These were forwarded in a Wardian case by the Torres Straits route, and arrived in good order, accompanied by the following information and instruction from the Under Secretary for Agriculture, Brisbane:—"The samples of rubber yielded by this plant are extremely good, the feature of the tree being that the greater part of the rubber is extracted from the fruit, which are of a large size and weigh about 2 lb. each. The tree is apparently quick-growing, and the collector from whom Christy and Co. obtained their seed advises that the rubber can be quite profitably extracted from the fruit without tapping the tree in any way. Christy and Co. have so far, unfortunately, been unable to identify the tree, but still they think it is one that should prove very valuable in connection with the rubber industry, and so it is desired that you plant the trees and give them every attention at the nursery."

On arrival of the Wardian case it was found to contain 103 plants, all living but considerably stunted. After being planted out into pots for a few months they were put out into the field, and sixty of the number survived and commenced to grow rapidly. During the first twelve months they attained a height of some 4 to 5 feet, and produced very large leaves, some being fully 15 inches by 9 inches. A number of plants, however, did not seem able to overcome the check occasioned by the confinement in the Wardian case, and gradually died out.

The majority of the plants grew well, and attained a height of about 8 feet in the second year, one producing a bunch of blossom from which two fruit subsequently were obtained. During the third year the trees grew but little, very few exceeding 9 feet in height. Most of them blossomed freely, however, and a number bore fruit. Specimens were then sent down to the head office, Brisbane, and were identified by Mr. F. M. Bailey, the Colonial Botanist, as *Tabernæmontana crassa*. The blossom produced was in sprays of ten to twelve individual blossoms on the one stalk; each blossom from 1 inch to 1½ inches in diameter, five-petaled, waxy in appearance, and particularly sweet-scented. From each spray of blossom seldom more than two fruit set, occasionally three, as is discernable in the accompanying illustration, but more often only one.

The fruit, which is quite globular, remained green for some months, and slowly increased in size until about 3 inches to 3½ inches in diameter, when it weighed from 14 oz. to 1 lb. No fruit grew much larger, and none so far have approached 2 lb. in weight. At this period the fruit was soft, the rind still green, and the interior spongy and containing a considerable quantity of milky sap. When left on the tree the fruit gradually turned brown, the spongy pulp dried away entirely, and the seed, of which each fruit contained eight to ten, become disconnected and free. The rind retained its shape for some time subsequently, and, as the contents dried, was in substance not unlike a small globular and dark-coloured gourd.

The rind is thin, however, and as it dried it became irregularly dented inwards or wrinkled, and eventually split at the dents, allowing the seed to fall.

When the fruit was full grown, but still green, on the rind being cut with a penknife or even pricked, considerable quantity of viscid milky latex was exuded. Most of this ran off the fruit and dropped to the ground, and what little adhered to the rind did not readily coagulate. When coagulation did take place, the latex lost its milky appearance very quickly, and became almost colourless, subsequently turning slightly yellow and remaining very sticky. On being scraped off the fruit with a knife, this substance appeared to have but little if any elasticity. On the fruit being cut deeply but little latex was obtained, but when lightly scored vertically at distances of only half-an-inch apart a considerable quantity was obtained, which was caught in small tin vessels. This proved a very slow process, as it was difficult to attach these vessels to the fruit in such a manner as to prevent the spilling of the latex by the swinging of the branch and fruit in the wind. When the fruit were removed from the tree, the milk very soon stopped flowing from them.



AN AFRICAN RUBBER TREE AT THE KAMERUNGA STATE NURSERY.

An experiment was made of taking several fruit from the trees, cutting them up and soaking in water, but even when the spongy pulp of the fruit was crushed in water nothing of the nature of rubber was obtained from either the residue or the water after evaporation. The milk obtained from the fruit scored as described was found to be roughly about half a fluid ounce from each fruit. This was allowed to coagulate naturally or by evaporation, being pure and free from bark, earth, or extraneous matter. Coagulation took place slowly, and first became evident by a waxy crust or cream, which on being broken through allowed the—until then still liquid—latex below it to coagulate likewise.

The coagulated substance retained its milk-white appearance until manipulated, when it turned almost black. In consistency the ball obtained was waxy and only slightly sticky; it hardened rapidly, and became eventually very like beeswax, though of a darker colour, easily cut or marked with any hard material, but requiring considerable force to alter its shape in the hand.

It presented in this form but little elasticity. The total result from some 5 to 5½ fluid ounces of latex was about ½-oz., and of solid matter.

One of the partners of the firm of Messrs. Tuck and Co., of Melbourne, rubber manufacturers (and consequently buyers of this material in the raw), being at that time in the North, this specimen was shown to him, and an expression of opinion asked. The opinion given was to the effect that, while the rubber could scarcely be proved or valued until sufficient were obtainable to put through the machinery, the specimen showed the rubber to be obviously waxy. Waxy rubber was the most difficult to treat, and consequently the lowest in value, but that possibly improved or different methods of extraction or collection might improve the quality.

This latter remark coincided with my own opinion; moreover, it would possibly prove easier to eliminate the waxy constituent in the course of or previous to coagulation than subsequently in the manufacture. The experiments in the direction of tapping, collecting, coagulating, &c., small as they were, and for many reasons not being possible of thorough trial this first season of bearing, are by no means considered conclusive. Indeed, the experiments so far are scarcely considered to have passed beyond the stage of acclimatisation and propagation of the plant itself in the field. In the coming season, however, it is proposed to go fully and carefully into the matter of collection, &c., and to publish results.

Of the tapped fruit some were gathered and opened, and found to be almost devoid of latex; of the majority left on the trees some few withered, but it was not observed that these yielded any more latex than others. The majority of fruit, however, seemed to recover, heal the wound in the rind, and in two to three weeks respond again to the scoring process, though feebly. No second tapping was made, though it would seem in some instances to be feasible, nor were any experiments conducted in tapping the trunks of the trees this season.

From fruit that ripened on the trees seed was obtained. The seed is black in colour, about ½-inch or less long by ¼-inch broad and wide, bean-like in shape, but irregularly dented or wrinkled. These have germinated readily, and therefore a quantity of plants will be available shortly which will admit of extreme experiments in tapping without fear of unduly reducing or losing the stock. Moreover, the seedlings raised from this seed are strong, and seem to promise quicker growth than those from England, which were all more or less checked or stunted by the long confinement in the Wardian case. The trees under cultivation here are hardy and strong, but, proving much smaller than anticipated, are found to have been planted at far too great distances—namely, 15 feet by 15 feet; 8 to 10 feet apart would have been quite far enough.

This species of rubber would seem to have the advantage of coming into bearing sooner than the better known rubber-producing plants or trees. The imported trees, which are now about three and a-half years old, came into bearing in their third year, but it is anticipated that seedlings from these may bear in their second year.

Provided the rubber can be obtained expeditiously, and the quality, by better methods of collection and coagulation, be improved, the fact of its being obtainable from the fruit, and the fact of the tree, as has been clearly shown, readily adapting itself to the conditions of climate, &c., in North Queensland, and proving to be exceptionally prolific a bearer as well, would make this tree one of the most valuable of its kind. While the value of this tree still depends upon the results of experiments to be carried out, it is by no means a foregone conclusion that it will be possible to obtain the rubber expeditiously from the latex. In connection with this, I may quote from the report of Mr. J. H. Hart, Superintendent of the Royal Botanic Gardens, Trinidad, dated 1898. He says, in reference to *Tabernaemontana crassa*: "This tree is a reputed rubber producer, and was grown on trial in these gardens for the past few years. Having a tree which had attained a large size, it was bled freely, and the latex was treated in different ways with a few of producing coagulation, but without

success. Eventually a substance was produced which resembled in appearance a lump of chalk or compact starch, quite brittle in character, and certainly not rubber."

As stated earlier, the trees are disappointingly small; but it is possible, as they increase in age, they may both grow taller and increase in girth. In connection with this, the following figures may prove of interest:—

	Quantity.
Number of trees imported for experiment	... 103
Of which now living	... 53
Seedlings raised from same, 1901	... 8
" " " " 1902	... —
Number of trees in bearing (more or less)	... 23
Largest tree—height, $11\frac{1}{2}$ feet; girth, at base, 13 inches; girth, at 2 feet, 9 inches.	
Average trees—height, about 9 feet; girth, at base, $8\frac{1}{2}$ inches; girth, at 2 feet, $5\frac{1}{2}$ inches.	
Largest fruit—weight, 1 lb. $1\frac{3}{4}$ oz.; diameter cut, $4\frac{3}{8}$ inches.	

Of the other varieties of *Tabernæmontana* no plants exist here; but it would be of interest, both for comparison and independent experiment, if seed or plants of the following varieties could be obtained by the Department:—*T. Thurstoni*, *T. coronaria*, *T. Stenosiphon*, and *T. Usambarensis*.

COTTON SEED AND ITS BY-PRODUCTS.

The following extracts taken from Mr. W. Henry's work, *Feeds and Feeding*, and from *The Cotton Plant* by Charles W. Dabney, Ph.D., Assistant Secretary, Department of Agriculture, United States of America, afford useful and reliable information with regard to the value of cotton seed and its products, cotton-seed meal and cotton-seed hulls, both as a stock food and as a fertiliser.

It is estimated in the United States that for each pound of cotton lint there are produced 2 lb. of cotton seed, or in the ratio of 1 to 2. This agrees with the results recorded in the West Indies. On the assumption that 900 lb. of raw cotton can be produced per acre in these islands, there would remain, after removing the lint, about 600 lb. cotton seed. According to Mr. Henry, the value of cotton seed as a stock food and also as a fertiliser is as follows:—

COTTON SEED AS A STOCK FOOD.

One hundred pound of cotton-seed meal contain in digestible nutriments—

Protein	... 37.2 lb.	} equal to	Protein	... 223.2 lb.	} per acre.
Carbohydrates	16.9 "		Carbohydrates	101.4 "	
Ether extract	12.2 "		Ether extract	73.2 "	

While 100 lb. cotton-seed hulls contain in digestible nutriments—

Protein	... 0.3 lb.	} equal to	Protein	... 1.8 lb.	} per acre.
Carbohydrates	33.1 "		Carbohydrates	198.6 "	
Ether extract	1.7 "		Ether extract	10.2 "	

COTTON SEED AS A FERTILISER.

Cotton-seed meal contains per 1,000 lb.—

Nitrogen	... 67.9 lb.	} approximately equal to	Nitrogen	... 136 lb.	} per ton.
Phosphoric acid	28.8 "		Phosphoric acid	58 "	
Potash	... 8.7 "		Potash	... 18 "	

Cotton-seed hulls contain per 1,000 lb.—

Nitrogen	... 6.9 lb.	} approximately equal to	Nitrogen	... 14 lb.	} per ton.
Phosphoric acid	2.5 "		Phosphoric acid	5 "	
Potash	... 10.2 "		Potash	... 21 "	

It is also stated that 100 lb. of cotton seed yield—

Cotton-seed meal	37.5 lb.,	or about	225 lb. per acre.
" " oil	12.5 " " "	75 " " "	
" " hulls	48.9 " " "	293 " " "	
Short lint	1.1 " " "	7 " " "	

The "short lint" is the small portions of lint left on seed after ginning.

MANURING COTTON.

With regard to the kind of fertiliser best suited for the cotton plant, opinions vary in different parts of the United States where cotton is extensively grown. As cotton lint, however, on analysis, is found to possess only a trace of nitrogen and mineral matter, whilst the seed is especially rich in these constituents, it may fairly be assumed that where cotton seed is not restored to the land in the form of manure the application of a fertiliser containing these ingredients is necessary to maintain the fertility of the soil. So far, the best results appear to have been obtained with chemical manures applied per acre in the following proportions, taking the crop at 300 lb. of cleaned lint per acre:—Nitrogen, 20 lb.; phosphoric acid, 50 lb.; potash, 15 lb. On the other hand, when cotton seed, or portions of it, are returned to the soil, the most satisfactory yields per acre are said to have been obtained from applications of the following compost:—

Green cotton seed	...	...	100 bushels.
Stable manure	...	...	100 "
Acid phosphate	...	...	2,000 lb.

applied at the rate of 400 lb. to 800 lb. per acre.—*Agricultural News, Barbados.*

Times of Sunrise and Sunset, 1903.

DATE.	JANUARY.		FEBRUARY.		MARCH.		APRIL.		PHASES OF THE MOON.
	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.	
1 ...	5.0	6.42	5.25	6.39	5.45	6.17	6.1	5.43	7 Jan. ☾ First Quarter 7 57 14 " ○ Full Moon 0 17 20 " ☾ Last Quarter 9 49 29 " ● New Moon 2 39
2 ...	5.0	6.42	5.25	6.38	5.46	6.16	6.1	5.42	
3 ...	5.1	6.42	5.25	6.38	5.46	6.14	6.3	5.40	
4 ...	5.1	6.42	5.27	6.37	5.47	6.13	6.3	5.38	
5 ...	5.3	6.43	5.28	6.36	5.48	6.12	6.4	5.38	
6 ...	5.3	6.43	5.29	6.36	5.49	6.11	6.5	5.37	5 Feb. ☾ First Quarter 8 13 12 " ○ Full Moon 10 58 19 " ☾ Last Quarter 4 23 27 " ● New Moon 8 20
7 ...	5.3	6.43	5.31	6.34	5.49	6.9	6.6	5.36	
8 ...	5.5	6.43	5.32	6.33	5.49	6.8	6.6	5.34	
9 ...	5.6	6.44	5.32	6.32	5.50	6.7	6.7	5.33	
10 ...	5.7	6.44	5.33	6.31	5.51	6.7	6.7	5.33	
11 ...	5.7	6.44	5.33	6.31	5.51	6.6	6.7	5.22	7 Mar. ☾ First Quarter 5 14 13 " ○ Full Moon 10 13 21 " ☾ Last Quarter 0 8 29 " ● New Moon 11 26
12 ...	5.8	6.44	5.33	6.31	5.52	6.5	6.7	5.31	
13 ...	5.9	6.44	5.34	6.30	5.52	6.4	6.8	5.30	
14 ...	5.10	6.44	5.34	6.30	5.53	6.3	6.9	5.29	
15 ...	5.11	6.43	5.35	6.29	5.53	6.1	6.9	5.27	
16 ...	5.11	6.43	5.36	6.28	5.54	6.1	6.9	5.27	5 Apr. ☾ First Quarter 11 51 12 " ○ Full Moon 10 18 20 " ☾ Last Quarter 7 30 27 " ● New Moon 11 31
17 ...	5.11	6.43	5.37	6.27	5.55	6.0	6.9	5.27	
18 ...	5.13	6.43	5.39	6.26	5.55	5.58	6.10	5.26	
19 ...	5.13	6.43	5.40	6.25	5.55	5.57	6.10	5.25	
20 ...	5.14	6.43	5.41	6.23	5.56	5.56	6.10	5.24	
21 ...	5.15	6.43	5.41	6.23	5.57	5.55	6.10	5.23	12 " ○ Full Moon 10 18 20 " ☾ Last Quarter 7 30 27 " ● New Moon 11 31
22 ...	5.16	6.42	5.41	6.22	5.57	5.53	6.11	5.22	
23 ...	5.18	6.42	5.42	6.22	5.58	5.53	6.12	5.21	
24 ...	5.18	6.42	5.42	6.22	5.58	5.52	6.12	5.20	
25 ...	5.19	6.41	5.42	6.20	5.58	5.50	6.13	5.19	
26 ...	5.19	6.41	5.42	6.20	5.58	5.49	6.13	5.18	
27 ...	5.20	6.41	5.43	6.19	5.59	5.48	6.14	5.17	
28 ...	5.21	6.41	5.44	6.18	6.0	5.48	6.15	5.16	
29 ...	5.22	6.40	...	...	6.0	5.46	6.16	5.15
30 ...	5.23	6.39	...	...	6.1	5.45	6.17	5.15
31 ...	5.23	6.39	...	...	6.1	5.45	...	...

Science.

CASSAVA AS A FEEDSTUFF.

Cassava is supposed to exist in at least two varieties, which are commonly known as Sweet Cassava (*Manihot aipi*) and Bitter Cassava (*Manihot utilissima*); but it does not appear quite conclusive, however, that more than one variety actually exists, and it is also indicated that the difference of sweetness and bitterness which distinguishes the supposed varieties may be only due to the conditions of soil and climate in which the cassava plants are grown.

Sweet cassava is grown in many subtropical and tropical countries, and is used as a human food, and likewise as a feedstuff for animals; and it is also very largely grown for its special character of starch, from which tapioca is manufactured. Cassava root is, in the first place, what is called a highly farinaceous material, its chief constituent being starch. The actual composition of cassava root, as expressed by its chief constituents, is seen in the following table of analyses, which table is accompanied with a similar statement of an analysis made by Dr. H. W. Wiley, in his very exhaustive study of Florida cassava, for food and tapioca-making purposes:—

	CASSAVA GROWN AT MACKAY EXPERIMENT STATION.		FLORIDA CASSAVA. Dr. H. W. Wiley.
	Green Material.	Calculated on Dry Material.	Calculated on Dry Material.
	Per cent.	Per cent.	Per cent.
Water	61.85	...	...
Nitrogen ... ..	.457	1.198	.555
Proteids (N x 6.25)	2.86	7.50	3.47
Starch	23.10	60.60	71.85
Sugars ... ..	.26	.68	} 17.43
Saponin ... ..	.31	.81	
Lecithin ... ..	.14	.37	
Crude Fat	1.00	2.62	2.01
Ash ... ..	.95	2.49	1.94
Water Soluble Extract—			
Total Water Soluble Matters	1.59	4.17	
Soluble Ash ... ..	.183	.48	
Nitrogen ... ..	.431	1.13	
Proteids	2.69	7.06	

From the above table it is seen that the chief food value of cassava root lies in the carbohydrate bodies, including, in the first place, starch and likewise some soluble sugars. The content of nitrogen, which indicates the amount of protein or flesh-forming bodies, is low, and it is also seen that the amount of these bodies can vary very notably. This is clearly shown by the analysis of the Florida cassava which was grown in almost pure sand, as compared with the sample grown at Mackay in a loam soil.

Expressed in everyday words, Dr. Wiley says:—"As a substitute for wheat bread, cassava flour is, of course, inferior in general nutritive or culinary properties. This is due to the high amount of starch and low proportion of proteid matters."

Compared with maize, another one of the great starch-yielding plants, cassava, and especially such as is represented by the Florida sample, is inferior as a balanced food material. While the dry material of cassava root is about equal in starch contents to maize, these investigations show that the Mackay cassava is notably poorer in proteids, containing not more than one-half of the nitrogenous flesh-forming bodies found in maize. It will also be shown, in a later publication upon the exhaustive examination of varieties of maizes grown in Queensland, that the amount of water-soluble carbohydrates is relatively much higher in maize than in cassava, a feature of some moment from the standpoint as value as feedstuffs.

Concerning cassava as a feedstuff in respect of the yield per acre of this crop, no exact data are at present to hand relating to Queensland. The growth at the Mackay Experiment Station indicates somewhere about 7 or 8 tons per acre. Bearing upon this question of the yield, Dr. Wiley expresses himself rather forcibly. He says, in speaking on cassava yields in Florida: "As is the case with all new and promising plants, the most extraordinary statements have been made with regard to the yield per acre of cassava roots. Many of these statements are outside all reason, running up to 20, 30, 40, and even 60 tons per acre."

Continuing, Dr. Wiley further states: "The profit which the farmer may make from growing cassava roots and the manufacture into tapioca should, in my opinion, be based upon a yield of 4 to 5 tons per acre." As already said, there are not sufficient data to indicate what the crop in average would be in Queensland.

The value of crops as feedstuffs can be very seriously interfered with by the presence of chemical bodies which are actually injurious to animal life. This applies, and also very seriously, to the cassava plant now under consideration. Already in 1877, Prof. Francis, the Government Chemist at Trinidad, reported on analyses of sweet cassava, and showed them to contain considerable amounts of hydrocyanic or prussic acid. Prof. Francis's work has been continued by his successor, Prof. Carmody, who shows in his yearly report (1901) that the sweet cassava contains nearly as much hydrocyanic acid as bitter cassava, with this difference: That in sweet cassava the poisonous principle is located in larger proportion in the outer skin and rind.

It has, therefore, been necessary to study the cassava grown in Queensland also from the standpoint of its possibly being, in its natural state, a crop unfit for animal use. Most careful examinations have been made in order to determine the amounts of hydrocyanic acid in the Mackay samples. In the first place, an analysis was made of an average sample of the cassava roots, when so high a content of hydrocyanic acid was found that it was necessary to repeat the examination. Further samples were obtained, including portions of the very youngest roots and also of roots which were not less than three years old. The roots of these samples were divided into two parts—namely, the outside or rind, and the inside, the really edible portion of the root. The amounts of hydrocyanic acid were determined in these samples respectively, and were found to be as follows:—

HYDROCYANIC ACID IN—							
				Natural Material.		Dried Material Calculated.	
				Per cent.	Grains per lb.	Per cent.	Grains per lb.
Young Cassava	{ Rind	...	...	·0434	3·04	·159	11·13
	{ Inside	...	...	·0227	1·59	·054	3·78
	{ Whole root	...	...	·0275	1·92	·071	4·97
Old Cassava	{ Rind	...	...	·0329	2·30	·110	7·70
	{ Inside	...	...	·0237	1·96	·060	4·20
	{ Whole root	...	...	·0256	1·79	·068	4·76
Average sample Cassava, whole root				·0292	2·04	·077	5·39

To make the meaning of these percentages amounts more clear, the results are expressed in the form of a number of grains of hydrocyanic acid contained in 1 lb. of several samples of the green and also calculated on the dried material.

So far as information is to hand, it is understood that 16 grains of hydrocyanic acid is a fatal dose for a horse, and again that 1 grain of the pure acid is fatal to a human adult. Data are not to hand to prove the doses which would be fatal to pigs, sheep, or cattle, yet from what is known of the power of these respective animals to resist the action of other known poisons it is reasonably concluded that doses ranging between that which is fatal to a human

adult on the one hand and to the horse on the other hand would be fatal to animals with powers of resistance ranging between these extremes. Then, as is seen from the above table, a horse would only need to consume 3 lb. of the dry material, corresponding to about 8 lb. of the green roots, to obtain its fatal dose, whereas 3 oz. of the dry or 8 oz. of the green roots could contain sufficient of the poison to be fatal to a man. It is, therefore, quite necessary to warn farmers and any others producing cassava roots against its use either as a human food or as a feedstuff for animals in its natural state.

The next question is, How can the material be treated to render it safe as a food for either men or animals? Work along these lines has already been done by Professor Carmody. This laboratory considered the matter of importance enough to determine how the poison can be removed by such means as are possible to farmers and others who may wish to make use of cassava as a feedstuff. The material was, therefore, treated first in several cases with cold water, and, secondly, with boiling water. The amount of poison being left in the roots after the various treatments is shown in the following table:—

Mode of Treatment of the Sliced Green Roots.	Hydrocyanic Acid left in the Green Roots.	
	Per Cent.	Grain per lb.
1. Treated with cold water for 24 hours, and water poured off (young roots)	·0162	1·134
2. Treated with cold water for 24 hours, and water poured off (young roots)	·0076	·532
3. Treated with cold water for 24 hours, water poured off, and treated with second lot of water for another 10 hours (young roots)	·0043	·301
4. Treated with boiling water for 9 hours, and water poured off (old roots)	Nil	Nil

It is thus shown that while the cassava root in its natural state contains a highly dangerous amount of hydrocyanic acid, yet by treatment of the cut-up material with water, as shown above, it can be rendered quite safe for food purposes. As a practical suggestion, it is advised that the cassava roots, if used at all, should be cut up into pieces and boiled in the same manner as potatoes are boiled for pig feed, the greatest care being taken that the water shall be completely removed, and the material further washed out with additional water.

Concerning the actual amount of hydrocyanic acid found in cassava root by different scientists and in different countries, the indications are very strong that the controlling factors will be found to be the nature of the soil and climatic conditions.

The data furnished by Dr. Wiley—covering the analysis of Florida cassava and the analysis contained in this statement of Mackay cassava—show very clearly that the amount of hydrocyanic acid in cassava root is relative to the amount of nitrogen contained in the roots. Again, the amount of nitrogen is determined by the nature of the soil in which the roots are grown; the Florida cassava was grown in almost pure sand and contained a minimum of nitrogen, whereas the Mackay roots were growing in a loam and contain double the amount of nitrogen. The action of the nitrogen content of the soil and of the nitrogen contained in manures applied to the soil, upon the formation of hydrocyanic acid, will be subject of further investigations, these investigations being made to cover not only cassava root, but also several other feed crops, including sorghum, maize, sugar-cane, teosinte, &c. Preparations are now being made for the continuation of these investigations, with the purpose of being able to inform our farmers what forage plants and at what age in their growth they may or may not be used with safety as feedstuffs.

J. C. BRUNNICH, Chemist.
W. MAXWELL, Director.

Department of Agriculture,
Chemical Section of Feedstuffs and Products.

Statistics.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE TOTAL RAINFALL FOR EACH MONTH OF THE YEAR IN THE AGRICULTURAL DISTRICTS OF QUEENSLAND.

STATIONS.	1901.		1902.										
	Nov.	Dec.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.
North.													
Bowen	0.92	0.71	0.19	2.19	2.01	0.68	Nil.	0.44	0.11	0.02	Nil.	0.06	0.06
Cairns	5.23	2.78	3.79	12.90	11.43	3.48	2.34	4.97	3.87	0.95	Nil.	0.16	1.38
Geraldton	6.45	1.60	3.78	16.87	7.55	12.83	5.39	8.10	7.32	1.77	Nil.	0.29	0.44
Herberton	1.13	1.30	0.57	5.77	3.86	1.54	1.07	1.58	2.05	0.08	Nil.	0.93	1.13
Hughenden	0.29	1.43	1.57	2.02	0.53	*	Nil.	Nil.	Nil.	Nil.	Nil.	0.05	0.22
Kamerunga	5.74	2.16	2.58	10.59	14.24	3.40	2.63	5.12	4.00	0.81	Nil.	0.29	1.57
Longreach	Nil.	1.71	0.87	0.27	0.18	0.03	0.03	Nil.	Nil.	0.05	Nil.	Nil.	1.27
Lucinda	Nil.	0.32	3.55	11.38	2.67	1.78	*	0.63	0.21	0.45	Nil.	0.22	0.10
Mackay	1.85	0.71	3.78	8.43	4.41	6.73	1.26	2.33	0.59	0.80	Nil.	0.17	0.35
Rockhampton	0.41	0.19	4.79	1.36	1.68	0.21	Nil.	Nil.	Nil.	0.09	1.41	0.05	0.51
Townsville	0.16	0.61	2.24	3.14	1.61	0.35	0.04	0.10	Nil.	0.10	Nil.	0.29	0.08
South.													
Barcaldine	0.55	0.09	2.39	0.07	0.37	0.02	Nil.	Nil.	Nil.	0.08	0.02	0.21	0.95
Beenleigh	1.35	0.14	2.41	1.82	0.68	0.42	Nil.	0.11	0.62	0.49	0.28	2.92	3.36
Biggenden	0.47	0.92	2.12	0.83	1.80	0.65	Nil.	0.04	0.08	0.04	1.58	2.34	0.25
Blackall	0.97	0.32	1.68	0.34	0.34	0.05	Nil.	0.01	0.01	0.21	0.27	0.12	1.05
Brisbane	1.41	0.75	1.38	2.67	0.78	0.17	0.47	0.06	0.55	0.98	1.30	3.42	2.59
Bundaberg	1.28	Nil.	6.33	0.75	1.99	0.43	0.02	Nil.	0.07	0.13	0.31	1.24	0.65
Caboolture	3.17	3.45	2.29	2.66	1.29	1.99	Nil.	0.03	0.20	0.05	1.09	2.30	3.17
Charleville	0.65	0.96	0.47	0.22	0.42	0.23	Nil.	0.12	Nil.	1.04	0.30	1.05	2.14
Dalby	0.15	0.42	1.65	0.20	0.39	2.00	Nil.	0.15	Nil.	0.41	0.70	3.14	2.79
Emerald	0.09	0.63	3.28	1.11	0.97	0.30	Nil.	0.01	Nil.	Nil.	0.02	0.01	1.58
Esk	1.08	2.20	1.81	1.06	0.75	1.25	Nil.	0.04	0.25	0.15	0.64	0.93	4.00
Gatton College	0.86	0.26	2.27	1.58	0.28	*	0.04	0.03	0.04	0.64	0.73	2.41	3.72
Gayndah	0.04	0.38	2.54	0.51	0.99	0.81	0.29	Nil.	Nil.	0.05	0.64	2.10	2.08
Gindie	0.02	0.57	1.35	1.46	0.78	0.47	Nil.	Nil.	Nil.	Nil.	0.10	Nil.	1.65
Goondiwindi	0.21	0.20	2.06	0.75	1.20	0.06	0.02	0.41	Nil.	1.19	0.21	1.50	0.69
Gympie	1.34	1.25	1.49	1.65	2.33	1.09	0.23	Nil.	0.36	0.94	1.38	3.80	1.40
Ipswich	1.17	0.35	1.45	2.80	0.32	0.03	0.02	0.15	0.31	0.77	0.30	2.86	3.45
Laidley	1.10	1.65	1.79	1.94	0.39	0.10	0.20	0.06	Nil.	0.40	0.89	2.21	3.27
Maryborough	1.84	1.54	1.29	0.75	0.93	1.57	0.36	0.24	0.29	0.57	0.69	0.91	1.11
Nambour	2.85	3.89	1.30	2.06	1.61	†	0.28	0.04	*	0.70	0.35	1.26	1.66
Nerang	2.70	0.46	3.98	4.54	0.65	0.65	0.35	0.62	1.07	1.22	1.17	3.15	1.75
Roma	0.54	0.83	2.72	1.11	0.54	0.15	Nil.	0.20	Nil.	0.46	0.35	0.92	0.86
Stanthorpe	2.22	1.67	3.17	0.51	0.56	0.10	0.87	0.78	0.15	0.94	0.95	2.29	3.98
Tambo	Nil.	0.16	1.73	0.35	0.68	0.04	Nil.	0.01	Nil.	0.28	0.06	0.41	1.31
Taroom	0.42	0.31	0.53	1.82	1.30	0.33	Nil.	Nil.	Nil.	0.17	0.45	0.68	1.40
Tewantin	1.66	2.70	3.09	1.13	3.44	2.84	0.80	0.91	0.91	0.85	0.87	1.94	1.96
Texas	0.26	0.43	1.95	1.62	0.42	Nil.	Nil.	0.88	Nil.	1.57	0.13	2.45	1.67
Toowoomba	1.10	0.87	3.46	1.20	Nil.	0.79	0.03	0.38	0.19	0.50	0.37	3.07	3.18
Warwick	1.19	0.71	3.48	0.65	0.55	Nil.	0.15	0.63	0.20	0.94	0.43	2.96	2.87
Westbrook	0.59	0.31	3.21	1.04	0.06	0.41	Nil.	0.28	0.06	0.29	0.38	3.20	3.34

CLEMENT L. WRAGGE,

Wragge's Weather Bureau.

PRICES IN BRITISH MARKETS OF ARTICLES WHICH CAN BE PRODUCED IN QUEENSLAND.

BUTTER.—Australian, none yet arrived. First shipment of the season was due in London from Melbourne on 13th December—1,227 cwts. First arrival from New Zealand of 238 boxes and 98 kegs on 7th November. Danish, 112s. to 118s.; Canadian, 96s. to 104s. per cwt.

CHEESE (duty free).—American, 53s. to 54s.; Canadian, 52s. to 56s. per cwt.

CONDENSED MILK.—18s. 6d. to 20s. 6d. per case in 20-case lots.

SUGAR (duties, raw, 2s. to 3s. 10d.; refined, 4s. 2d. and $\frac{1}{4}$ per cent.).—Refined, £14 to £17; raw, £12 to £14 per ton. German beet, 88 per cent., 7s. 4 $\frac{1}{2}$ d. per cwt.

MOLASSES (duty, 2s. per cwt. and $\frac{1}{4}$ per cent.).—5s. 9d. to 7s. per cwt.

RICE (duty 5d. per cwt.).—Rangoon, £7 10s. to £14.; Japan, £12 10s. to £17; Java, £18 to £24; Patna, £17 to £21 per ton.

COFFEE (in bond, duty 1 $\frac{1}{2}$ d. per lb. and $\frac{1}{4}$ per cent.).—Ceylon plantation, 45s. to 120s.; peaberry, 74s. to 123s.; Santos, 28s. to 58s.; Mocha, 55s. to 70s.; Jamaica, 100s. to 124s. per cwt.

ARROWROOT (duty, 5d. per cwt.).—Bermuda, 1s. 3d. to 1s. 6d.; St. Vincent, 3d. to 5 $\frac{1}{2}$ d.; Natal, 5d. to 8d. per lb.

WHEAT.—Victorian and South Australian, 32s.; Duluth, red, 31s. 3d.; Manitoba, 34s. 6d. per 480 lb.

FLOUR.—14s. to 26s. per 280 lb.

MALTING BARLEY.—28s. per 448 lb.

OATS.—New Zealand, 26s. to 28s. per 384 lb.; Canadian, 28s. to 31s. per 320 lb.

SPLIT PEAS.—45s. per 504 lb.

GINGER.—Japan, 35s. to 36s.; Jamaica, 50s. to 55s.; low and common, 36s. to 38s. per cwt.

PEPPER.—Black, 5 $\frac{3}{4}$ d. to 6 $\frac{1}{4}$ d.; white, 9d. to 9 $\frac{1}{4}$ d. per lb.; capsicums, 16s. to 80s.; chillies, 34s. to 40s. per cwt.

TOBACCO.—No report to hand. Queensland tobacco grown at the State Farm, Texas, sold by auction at 11d. per lb.

WINES.—Australian Burgundy, red, 18s. per dozen; 17s. to 23s. per dozen quart flagons.

GREEN FRUIT.—Oranges, 8s. to 17s. per case; lemons, 22s. to 33s. per case of 420; bananas, 9s. to 12s. 6d. per bunch; American apples, 10s. to 18s. per case; grapes, 10s. to 30s. per barrel.

COTTON.—Uplands, 4 $\frac{3}{4}$ d.; Sea Island, 8d. to 9d. per lb.

COTTON SEED.—No quotation.

COTTON-SEED OIL CAKE.—£6 8s. 9d. to £7 per ton.

COTTON-SEED OIL.—19s. 9d. to 20s. per cwt.

LINSEED.—44s. 6d. to 48s. 6d. per 410 lb.

LINSEED OIL.—22s. to 23s. 6d. per cwt.

LINSEED OIL CAKE.—£7 7s. 6d. to £7 per ton.

MANILLA HEMP.—£25 to £30 per ton.

NEW ZEALAND HEMP.—£33 10s. per ton.

FROZEN MEAT.—The following are the Frozen Meat Trade Association's Smithfield market quotations for the undermentioned classes of frozen meats, based on actual sales of not less than 100 carcasses of mutton or lamb, or 25 quarters of beef of fair average quality. These quotations are not for selected

lines, but for parcels fairly representative of the bulk of the shipments now on the market:—

New Zealand Sheep.

(Crossbred Wethers and Maiden Ewes.)

	Dec. 6.	Dec. 13.
Canterbury, light (48 lb. to 56 lb.)	5 $\frac{1}{8}$ d.	5 $\frac{5}{16}$ d.
Canterbury, medium (56 lb. to 64 lb.)	5 $\frac{1}{8}$ d.	5 $\frac{5}{16}$ d.
Canterbury, heavy (64 lb. to 72 lb.)	5 $\frac{1}{8}$ d.	5 $\frac{5}{16}$ d.
Dunedin and Southland (56 lb. to 64 lb.)	...	...
North Island (55 lb. to 65 lb.)	None offering.	—
	4 $\frac{1}{16}$ d.	5 $\frac{1}{8}$ d.

Australian Sheep.

(Crossbred or Merino Wethers.)

Heavy (over 50 lb.)	...	—	None offering.
Light (under 50 lb.)	...	—	None offering.

River Plate Sheep.

(Crossbred or Merino Wethers.)

Heavy (over 50 lb.)	...	4 $\frac{3}{4}$ d.	4 $\frac{3}{4}$ d.
Light (under 50 lb.)	...	4 $\frac{3}{4}$ d.	4 $\frac{3}{4}$ d.

New Zealand Lambs.

Canterbury, light (28 lb. to 36 lb.)	5 $\frac{3}{8}$ d.	5 $\frac{3}{8}$ d.
Canterbury, heavy (36 lb. to 42 lb.)	5 $\frac{5}{8}$ d.	5 $\frac{3}{4}$ d.
Dunedin and Southland (28 lb. to 42 lb.)	...	5 $\frac{1}{2}$ d.
North Island (28 lb. to 42 lb.)	—	None offering.

Australian Lambs.

30 lb. to 40 lb.	...	None offering.	5 $\frac{3}{8}$ d.
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River Plate Lambs.

30 lb. to 40 lb.	...	—	None offering.
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New Zealand Frozen Beef.

Ox, fores (180 lb. to 220 lb.)	...	4 $\frac{1}{8}$ d.	4 $\frac{1}{8}$ d.
Ox, hinds (180 lb. to 220 lb.)	...	4 $\frac{7}{8}$ d.	4 $\frac{7}{8}$ d.

Australian Frozen Beef.

Ox, fores (160 lb. to 200 lb.)	...	3 $\frac{3}{4}$ d.	3 $\frac{3}{4}$ d.
Ox, hinds (160 lb. to 200 lb.)	...	4 $\frac{1}{4}$ d.	4 $\frac{1}{4}$ d.

River Plate Frozen Beef.

Ox, fores (160 lb. to 220 lb.)	...	3 $\frac{1}{16}$ d.	3 $\frac{1}{16}$ d.
Ox, hinds (160 lb. to 220 lb.)	...	4 $\frac{7}{16}$ d.	4 $\frac{7}{16}$ d.

These prices are the official quotations furnished by the Frozen Meat Trade Association. The basis of quotations is sales of lines of not less than 100 carcasses of mutton or lamb, or twenty-five quarters of beef. All the quotations for mutton are for average quality. Quotations of Australian and New Zealand lambs do not include sales of small lambs or heavies or inferior quality.

EGGS.—French, 9s. 6d. to 11s. 9d.; Danish, 11s. to 12s. 6d. per 120.

BACON.—Irish, 61s. to 65s.; American, 64s. to 66s.; Canadian, 54s. to 61s. per cwt.

HAMS.—Irish, 84s. to 102s.; American, 56s. to 66s. per cwt.

TALLOW.—Beef, fine, £35 15s.; medium, £31 10s.; mutton, fine, £36 10s.; medium, £32 10s. per ton.

Agricultural Patents.

PATENTS ACCEPTED.

WINNOWER DETAILS.—Class 29 (4 Figures)—6561: George Henry Dunn, of Bendleby, South Australia, Australia, farmer. "Improvements in Winnowing or Grain Cleaning Machines." Dated 7th April, 1902. (Drawings, 20s.; specification, 7s. 6d.) The shoot leading the thrashed grain to the shaking sieve moves with it, and has foot flap on a rock bar that may be set at various angles (by a spring bolt in a sector) to give the grain a greater or less fall on to the sieve through which the blast passes.

The grain shoot at the foot of the shaking sieve and its tail board beyond are also attached to the sieve by bolts in adjusting slots; its external lower end projects outside the machine.

The bag holder has hooks at the end of a bar passing through two staples against the frame above the grain shoot, and a third hook is on a projecting arm welded to the first bar, the third hook being upheld by a short chain to the frame above; by lifting the front hook the back hooks rotate and become disengaged from the bag, and on releasing the chain the front hook is detached. (3 claims.)

BALL-BEARINGS FOR CANE SAWS.—Classes 30, 61 (3 Figures)—6530: Edward Garland Abell, of 159 Queen street, Brisbane, Queensland, registered patent agent. "Improvements in Appliances for Cutting Sugar-cane and other like Crops." Dated 21st March, 1902. (Drawings, 20s.; specification, 3s. 6d.) In cane-cutting machines, such as in Specification No. 5942, the saw-spindle is mounted in ball-bearings of the cycle type, on a tubular frame, containing also a driving-shaft with bevil gear. The object is to bring the saw nearer to the ground, and to exclude dust from the bearings. (1 claim.)

6538: James Henry Anderson, of the firm of Anderson, Anderson, and Anderson, Limited, 35 Saint Paul's Churchyard, London, E.C., England, manufacturer. "Improvements in Golf Practice Apparatus." Dated 25th March, 1902. (Drawings, 7s. 6d.; specification, 6s.)

FENCING POSTS AND DROPPERS; REVERSED SLOTS.—Class 35 (5 Figures)—6345: Frederick William Bursill, of Sedgemere, Awatere, Marlborough, New Zealand, sheep farmer. "Improved Means of Securing Fencing Wires in Standards, Swingers, and the like." Dated 25th November, 1901. (Drawings, 10s.; specifications, 4s. 6d.) In fixing wires in fences by single or double inclined slots (as in British Specifications 4148 of 1882, and 6439 of 1890), the several slots in the post or dropper are placed at different angles so that the straightening tendency of the tightened wires will balance on the dropper and maintain it in a vertical position. A kinking lever is illustrated for facilitating the insertion of the wires in the oblique slots. (3 claims.)

CHAFF PRESS; PLATEN LIFTED BY ROPE TACKLE AND WINCH.—Class 58 (3 Figures)—6552: Edwin Rowe, storeman in the employment of Messieurs Denham Brothers, merchants, of Mary street, Brisbane, Queensland, and Digby Frank Denham, of Brisbane aforesaid, merchant, a member of the said firm. "A Chaff Press." Dated 2nd April, 1902. (Drawings, 15s.; specification, 2s. 6d.) The press has wooden framing, the platen being lifted between the side ports. At each side are four-ply pulleys, the wire rope being hauled by a single geared winch (with two barrels) over the top of the press; the operating axle has a large spoke wheel for hauling, and the main gear wheel has a lever hand-brake. (1 claim.)

6599: Ernest James Hume and Walter Reginald Hume, both of Junction Building, Mollison street, Malmsbury, Victoria, machinists. "Improvements in Stump Jumping Harrows." Dated 25th April, 1902. (Drawings, 8s. 6d.; specification, 7s. 6d.)

General Notes.

NUMBER OF PLANTS PER ACRE.

In the table published in the October issue of the *Journal*, giving the number of plants per acre at different distances, an error occurred in the number required at 8 feet apart. The number should be 680, instead of 980.

SETTING TOMATO PLANTS.

Dr. Henkel has a new method of setting tomato plants, which is well worthy the attention of other horticulturists. He uses a cone made of stiff paper with a small hole at the apex. The root of the plant is pushed outward through the apex opening, the stem remaining within the cone, some earth is put around the stem, and the plant thus surrounded is put in a hole in the soil, and so planted that the rim of the cone is an inch or two above the surface. The special value of this method of planting is that the cone protects the plant from cut-worms, and retards the drying of the earth around it.—*Exchange*.

COTTON IN THE ENGLISH MARKET.

The following are the latest quotations for West Indian cotton (lint) :—

Sea Island	...	...	...	8½d.	nominal.
King's Improved	...	...	...	4½-¾d.	"
Peterkin	...	...	...	4½-⅝d.	"
Russell's Big Ball	...	...	...	4¾-½d.	"

TRASHING BY WHITE LABOUR.

The *Delta Advocate* says that the second experiment in harvesting cane by white labour on the Johnstone River gave the following results :—Eight men trashed and cut 245 tons in twenty eight days, showing a total per day of 8 tons 15 cwt. The average per man was 21 cwt. 3½ quarters. At 5s. per ton, the rate paid, each man averaged 5s. 5d. and a fraction per day, out of which the cost of living had to be paid.

INSECTS ATTACKING SWEET POTATOES.

The *Agricultural News*, Barbados, says that potatoes attacked by red spiders first turn yellow, then the leaves fall off and the plant dies. If the attack does not become serious till after the potatoes have been formed, there may be little or no loss. But the attack must be met in time. The best remedy is spraying with kerosene emulsion and dusting with a mixture of lime 4 parts, flowers of sulphur 1 part. Either of these will prove successful, and, if adopted immediately the attack commences, will be found so simple and inexpensive as to be well worth employing.

BOTANISTS AND ENTOMOLOGISTS.

Who can fitly estimate the amount annually saved to the farmer by the researches of botanists and entomologists? The student of fungi alone becomes a benefactor, for mould, blight, and mildew, as well as many of our own diseases, arise from the prevalence of active spores. We should then, in all ways, encourage those who, with microscope and chemicals, wage upon these pests an unrelenting war.

A SCAVENGER FLY.

A Trinidad planter has found some flies on diseased bananas. The chrysalis case (puparium) of the flies showed clearly that the grub was what is known as a "rat-tailed maggot"—that is, a maggot with a long telescopic tail which enables it to live buried in liquid or semi-liquid matter, the long tail being stretched to the surface to get air. Probably the grubs of the fly lived in the decaying matter of the bananas; it is improbable that they are in any way hurtful. They are more likely useful members of the great tribe of "scavengers" to which we owe so much.

A CURE FOR SNAKE BITE.

A correspondent at Mooloolah sends us a cutting from the *Allahabad* (India) *Pioneer*, from which we make extracts, as we think that any possible cure for snake bite should be made known to all.

A lady at Madras says that her husband was stung by a bee, and instantly allayed the pain by rubbing the wound with malt vinegar. This gave him an idea. He went to a syce (groom) and asked him to get him a scorpion, as he wished to find a cure for their sting. He also offered a rupee to any syce who would allow himself to be stung, knowing that a man would not die from a scorpion sting. In the evening the man and the scorpion were brought to him. The scorpion, a large black one, stung the man on the middle finger, and the pain soon went to the elbow, the man writhing in pain. A ligature was tied above the wound, and vinegar was rubbed in. In twenty minutes all pain had ceased.

The experimenter then thought he would try the vinegar for snake bite, and one day a large cobra was brought to him. As no dog was available as a victim, a fowl was experimented on. The leg of the bird was bared of feathers. Then it was tied to a bamboo and placed near the snake, which bit the poor animal savagely. For three and a-half hours vinegar was rubbed in, the wound first becoming scarlet, then green, and finally the whole leg was black. The fowl recovered.

Soon afterwards a dog was bitten by a cobra in two places. The wound was at once scarified and vinegar rubbed in for over three hours. Then the leg underwent the same changes as in the case of the fowl, and the dog recovered. To prove that the snake's venom was present, some Brahmins asked that another dog might be bitten by it. This was done, but no vinegar was rubbed in, and the dog died in three-quarters of an hour. Directly afterwards it bit a dog on the tongue, and also bit a fowl. Both died in half-an-hour. A dog which was bitten three times was treated, and lived.

A woman in Trinchinopoly was bitten by a snake in the back of the hand while gathering firewood. The hand was much swollen. Brandy and vinegar were rubbed in, and the woman recovered.

Our correspondent says that there is no statement that vinegar is an infallible cure; the facts, however, are there. It would be well if anyone bitten by a snake in the bush in this State would try the remedy, and, if it proved successful, would publish the fact far and wide.

POTATOES £500 A TON!

Mr. T. Kime, potato-grower, &c., Mareham-le-Fen, near Boston, Lincolnshire, has bought a ton of the new variety Northern Star from Mr. Findlay at £500. We do not know whether this is a record, but should fancy it is. Of this variety Mr. Kime writes:—"I planted on 12th April last 22 lb. in weight. I have taken up produce over 15 cwt. in weight of very fine, handsome, sound tubers; twelve roots produced 149 lb., or an average of over 12 lb. per root; one root produced tubers weighing just over 14½ lb. One particularly handsome root had sixty-five beautiful tubers, weighing exactly 10 lb. The haulm of this potato resisted the blight longer than any other I have grown this season."—*Farmer and Stockbreeder*.

MISCHIEVOUS INFLUENCE OF DEFORESTATION.

A report to the Government of Kursk (Russia) says that the forests have been reduced during the years from 1881 to 1887 from 1,012,500 acres to 917,500 acres, or by 95,000 acres. Now droughts are increasing; many of the rivulets had formerly much more water, and it is certain that many of them could then drive mills. The water level in the soil has also been found to be lower in sixty wells, where farmers could formerly reach the water with their arms. Now there are at one village only five wells, and water can only be obtained from 6 to 12 feet from the surface. It is suggested that it is not only the direct influence of deforestation, but also the indirect influence of less rain, snow, &c. Willows to indicate the roads can now only be made to grow with great difficulty compared with the ease they were reared in former times.—*Garden and Field*.

PERUVIAN OR CUZCO MAIZE.

Steps (says the *Agricultural Journal* of Western Australia) were taken last season by the Department of Agriculture to import from Peru some of the large white maize which yields such large grains and is such a heavy yielder in South America. A quantity was ordered for last season, but it arrived too late to be of any use. The seed has been kept until the present time, and is now available for distribution. In connection with the seed, the following cutting may be of interest:—"Secretary James A. Filcher, of the State Board of Trade, has brought with him from Philadelphia a jar of Peruvian corn, the grains, of prodigious size, being white and shining, resembling nothing so much as horses' teeth. Unlike ordinary maize, they are not solid, but are composed of a thin, brittle shell, filled with a white flour, which seems to be a corn starch of Nature's fabrication. This wonderful plant grows from 20 to 28 feet in height in Peru, bearing two to three ears to a stalk, each of them from 18 to 20 inches in length and 3 to 4 inches in diameter. This Peruvian corn was first brought to the attention of growers in this country by the Philadelphia Commercial Museum, which placed some on exhibition two years ago, creating quite an excitement among Eastern agriculturists, who believed they had found something that would yield them a fortune. Repeated trials proved, however, that the plant would not mature during the short Eastern season. It is said to require not less than seven months for growth and ripening. Seeing it on exhibition by the Peruvian Government at Buffalo, Mr. Filcher succeeded in obtaining about a quart of the seed, which he is desirous of distributing among Californian farmers who have good corn land, and who will promise to plant the grains early and give them the best possible conditions for growth. He desires in return only a few choice stalks for exhibition at the Board of Trade rooms in the ferry building and at the Louisiana Purchase Exposition, which is to open in St. Louis in 1903. A practical farmer himself, well acquainted with California's capacity for assimilating foreign products, Mr. Filcher believes that the corn will grow in California, and fully expects to have it attain a height of 30 feet under her friendly skies."

[The corn has proved a failure in South Africa, all over Cape Colony, and the Transkei, where it was tried, the climate proving unsuitable for it.—Ed. *Q.A.J.*]

CAMPHORATED OIL.

The *Australian Farm and Home* says:—A simple home-made liniment that is almost magical in its results is composed of kerosene, camphor gum, and sweet oil. Into a quart bottle put one pint of kerosene, and add as much camphor gum as will dissolve, adding a little more day by day, and shaking thoroughly. Then add one half-pint of sweet oil, shake well, and it is ready for use. It should be well corked and kept out of the way of children. Use for burns, cuts, bruises, stiff neck, stiff joints, sore throat, bunions, and about all the ailments that flesh is heir to, as it will cure, and that right speedily, almost everything; in our family it has gained the name of "cure-all."

SEEDS.

The time during which seeds will maintain their power of germination in an unimpaired condition depends upon many circumstances, storage and ripeness in particular. There is much diversity of opinion upon this point, and the experiments recorded vary considerably in their results on account of the almost certain want of uniformity of quality of seed to begin with in the different series of experiments.

SAFE AGE TO USE SEEDS.

For practical purposes, however, the following table, compiled from various sources, chiefly Percival's "Agricultural Botany," indicates the time beyond which it is inadvisable to use the seeds mentioned :—

Wheat, 2 years	Mustard, 3 to 4 years
Oats, 2 years	Mangold, 3 years
Barley, 1 to 2 years	Carrot, 1 year
Rye, 1 to 2 years	Cabbage, 3 to 4 years
Maize, 1 to 2 years	Kale, 3 to 4 years
Peas, 4 to 5 years	Kohlrabi, 3 to 4 years
Beans, 4 to 5 years	Clovers, 2 years
Buckwheat, 2 years	Sainfoin, 2 years
Turnip, 3 to 4 years	Lucerne, 2 years
Swede, 3 to 4 years	Onion, 1 year.

Poor germinating capacity may be due to imperfect development of the embryo during ripening, mechanical injury in thrashing, and too high a temperature and excess of moisture in the storeroom.

No matter what the cause may be, the death of the seed or its weakness can readily be tested, and no seed should ever be sown for an important crop without this being done. It is also advisable for the farmer to have some guarantee from the vendor in respect to the germination capacity, and refuse to purchase from those who will not give it.

HOW TO TEST GERMINATING POWER.—The following is a simple method which can be used for many kinds of seed :—Moisten a piece of thick blotting paper with water without making it dripping wet, fold it once, and place it upon an ordinary plate. Take two lots of about 200 seeds each, distribute them fairly evenly on the blotting paper, and cover them with another sheet of similar paper. This done, the whole should then be covered with another plate turned upside down or a sheet of glass, in order to prevent too rapid evaporation of the water, and placed in a warm room.

For each particular kind of seed there is a definite temperature, at which germination goes on best, and in special instances, to secure accurate results, it is necessary to be able to control the heat supplied to seeds. A temperature, however, of about 62 degrees Fahr. is suitable to most ordinary seeds, with the exception of barley, which germinates best when kept slightly lower than this—viz., 57 degrees to 58 degrees Fahr.

During the trial remove the upper plate at least once or twice every day to allow the carbon dioxide gas produced to diffuse away and fresh air to get at the seeds. Take away the germinated ones as soon as the embryo shows itself, and make a note of the number.—*Garden and Field.*

A HONEYCOMB UNCAPPER.

Mr. J. Proud, of Broadwater Park, Southport, has devised a simple contrivance here illustrated for uncapping comb. It consists of a box B, which may be made of a kerosene tin enclosed with wooden sides, having the top open. On this box at EE is fitted another A, having a wire gauze strainer at

Answers to Correspondents.

COMPARATIVE VALUES OF CEREALS AND OIL CAKE AS FOOD SUBSTANCES.

J.B.S., PIALBA.—

	Maizemeal.	Oatmeal.	Wheat.	Bran.	Oil Cake.
Crude protein ...	10.5	12.5	11.9	15.4	21.5
Crude fibre ...	2.1	12.7	1.8	9.8	27.6
Nitrog. free extract ...	69.6	64.1	71.9	63.5	42.8
Crude fat ...	5.4	6.3	2.1	4.4	3.7
Ash ...	1.5	4.4	1.8	6.8	4.4
Contain Phosphor. Acid	0.70	1.3	0.9	3.4	0.9

1. As food, oatmeal the best on account of high amount of proteids, fat, and high amount of phosphoric acid. Wheat comes next in value, and maize a very close third.

2. Can find no analysis of pie melon.

3. No analysis of banana plant.

4. Have not seen a stated analysis of "Sunlight" cake, but above is an analysis of oil cake. It is seen that it is richer in proteids and fibre, but poorer in fat, and very much poorer in phosphoric acid than bran.

ERADICATION OF NUT GRASS.

MEDIUM, KOLAN.—No experiments have been carried out at the Queensland Agricultural College with a view to exterminating nut grass.

PIGS AND RHUBARB.

C. W. GREGORY, BROOKFIELD.—The Chinese gardeners do not use any sprays on their vegetables. The probability, therefore, is that the oxalic acid contained in the leaves and peelings of the rhubarb eaten by your pigs was the cause of their death. Rhubarb should never be thrown to pigs. It is fatal to them.

HAY PRESS.

DAIRYMAN, BOWEN.—In our next. A plan is being prepared.

WATER-LOGGED LAND.

COLEN CAMP, BOWEN.—If the slope is very slight, run shallow drains, from 18 to 20 feet apart, with the dip. If the slope is very great, the soil will wash away to a great extent during heavy rains. In that case your drains should not be longer than 200 yards; a sub-drain should then be put in across the lateral drains in a slanting direction into which they will all lead.

HEATING VALUES OF FUEL.

WOODMAN, EURI CREEK.—We cannot supply the information you require. As regards coal, the highest grade coal contains 13,000 heat units per lb., good ordinary coal 10,000, and coke 7,000 units. A heat unit is roughly the amount of heat required to raise the temperature of 1 lb. of water 1 degree Fahr., so that 1 lb. of coke has sufficient heat to raise 100 lb. of water 70 degrees. It never does so in practice, as difference of climate and temperature show a marked difference with the same fuel. Bloodwood and ironbark have the best heating properties for steam purposes.

DEVIL DEVIL LAND.

MERINDA.—Without seeing the soil, it is impossible to advise you what crops it is suited for. There is the same class of land near Mackay and Townsville which will grow good crops of corn and oats. Around Brisbane such land will grow nothing.

GINSENG—RETURN PER TREE FOR FRUIT TREES—FOWL MANURE.

READER, TOOWONG.—See *Journal*, Vol. X., Feb., 1902, pp. 121, 438, for information on Ginseng Culture. This Department has taken steps to obtain seed or roots from Japan. As the plant is worth its weight in gold, and often brings as much as £50 per ounce, you must be prepared to pay a high price for roots if they are obtainable.

With regard to the cash returns from fruit trees, this depends on the kind of tree, its age, and on the soil in which it is planted. Thus, oranges and mandarins properly looked after should give an average of at least four to six cases from tree at ten years of age. Apples will give about the same in the Stanthorpe district, peaches the same quantity in from six to seven years. Japanese plums about the same as peaches. European plums and prunes from 150 to 200 lb. per tree. Pears from two to three cases at ten years. Mangoes from eight to ten cases at ten years—in the North this is often more than doubled. Apricots from three to four cases at six years old.

There is no objection to fowl manure being worked into the land, provided that it is not applied in too large a quantity, and that it is well mixed with the soil. If in excess, it would be apt to burn the roots of the plants.

The Markets.

TOP PRICES FOR FRUIT—ROMA-STREET MARKETS.

Article.	NOVEMBER.
	Top Prices.
Cooking Apples, per case	12s. 6d.
Eating Apples, Tasmanian, per case	15s.
Eating Apples, American, per case	24s.
Oranges, per case	10s.
Oranges, Seville, per case	4s.
Lemons, per case	10s.
Lemons, Italian, per case (180)	18s.
Gooseberries, Cape, per quart	5d.
Gooseberries, English, per quarter-case	6s.
Strawberries, per quart	1s. 6d.
Passion Fruit, per quarter-case	5s. 6d.
Papaw Apples, per quarter-case	2s. 6d.
Cherries, per quarter-case	12s.
Apricots, per half-gincase	12s.
Apricots, per quarter case	6s. 6d.
Plums, per quarter-case	6s.
Pineapples, rough, per dozen	5s.
Pineapples, Queen, per dozen	6s. 6d.
Bananas, per bunch	2s.
Bananas, per dozen	3d.
Mangoes, per case	10s.
Tomatoes, per quarter-case	5s. 6d.

AVERAGE TOP PRICES FOR NOVEMBER.

Article.							NOVEMBER.			
							Top Prices.			
							£	s.	d.	
Bacon	...	...	...	...	...	...	lb.	0	1	1 $\frac{1}{2}$
Bran	...	...	...	...	...	...	ton	9	12	0
Butter, First	...	...	...	...	...	...	lb.	0	1	0 $\frac{1}{10}$
Butter, Second	...	...	...	...	...	...	"	0	0	10 $\frac{1}{10}$
Chaff, Mixed	...	...	...	...	...	...	ton	7	15	0
Chaff, Oaten	...	...	...	...	...	...	"	7	15	0
Chaff, Lucerne	...	...	...	...	...	...	"	10	18	0
Chaff, Wheaten	...	...	...	...	...	...	"	7	0	0
Cheese	...	...	...	...	...	...	lb.	0	0	10 $\frac{1}{2}$
Flour	...	...	...	...	...	...	ton	11	16	0
Hay, Oaten	...	...	...	...	...	...	"	7	0	0
Hay, Lucerne	...	...	...	...	...	...	"	8	10	0
Honey	...	...	...	...	...	...	lb.	0	0	3
Rice, Japan (Duty paid)	...	...	...	...	...	...	ton	22	0	0
Maize	...	...	...	...	...	...	bush.	0	5	2 $\frac{4}{5}$
Oats	...	...	...	...	...	...	"	0	4	4
Pollard	...	...	...	...	...	...	ton	10	3	0
Potatoes	...	...	...	...	...	...	"	11	6	0
Potatoes, Sweet	...	...	...	...	...	...	"	8	0	0
Pumpkins	...	...	...	...	...	...	"	8	0	0
Sugar, White	...	...	...	...	...	...	"	20	5	0
Sugar, Yellow	...	...	...	...	...	...	"	17	2	0
Sugar, Ration	...	...	...	...	...	...	"	13	0	0
Wheat	...	...	...	...	...	...	bush.	0	5	9 $\frac{4}{5}$
Onions	...	...	...	...	...	...	cwt.	0	7	4 $\frac{4}{5}$
Hams	...	...	...	...	...	...	lb.	0	1	3
Eggs	...	...	...	...	...	...	doz.	0	1	2 $\frac{1}{2}$
Fowls	...	...	...	...	...	...	pair	0	5	6 $\frac{3}{5}$
Geese	...	...	...	...	...	...	"	0	7	10 $\frac{1}{5}$
Ducks, English	...	...	...	...	...	...	"	0	5	9
Ducks, Muscovy	...	...	...	...	...	...	"	0	7	7 $\frac{1}{5}$
Turkeys, Hens	...	...	...	...	...	...	"	0	13	7 $\frac{1}{5}$
Turkeys, Gobblers	...	...	...	...	...	...	"	1	0	9 $\frac{3}{5}$

ENOGGERA SALES.

Article.										NOVEMBER.		
										Top Prices.		
										£	s.	d.
Bullocks	...	...	...	...	...	...	...	...	...	19	6	0
Cows	...	...	...	...	...	...	...	...	...	14	0	0
Wethers, Merino	...	...	...	...	...	...	...	...	...	1	5	6 $\frac{1}{2}$
Ewes, Merino	...	...	...	...	...	...	...	...	...	1	1	8 $\frac{1}{2}$
Wethers, C.B.	...	...	...	...	...	...	...	...	...	1	5	7
Ewes, C.B.	...	...	...	...	...	...	...	...	...	1	4	6
Lambs	...	...	...	...	...	...	...	...	...	0	13	1 $\frac{1}{2}$
Baconers	...	...	...	...	...	...	...	...	...	3	17	6
Porkers	...	...	...	...	...	...	...	...	...	1	12	8
Slips	...	...	...	...	...	...	...	...	...	0	9	9

Orchard Notes for January.

By ALBERT H. BENSON.

In bearing deciduous orchards, the chief work of the month will be the gathering and marketing of the fruit. This work requires to be carried out in a much better and more systematic manner than is usually the case, as a great deal of our fruit is badly handled, badly graded and packed, and is sent to market in a very unattractive manner. Good fruit always pays for careful handling and neat packing. Use clean new cases, grade the fruit for quality and size, and carefully examine it for fruit fly, scale insects, or codlin moth. All infected fruit should be destroyed by boiling, and be then fed to pigs or poultry, as its presence in the case is apt to condemn the whole when same is examined by the inspectors under the Diseases in Plants Act.

When codlin moth is present, the bandages should be examined every week, and all larvæ found therein destroyed, and all moth-infested fruit should be gathered and destroyed. If this method of treatment is carefully carried out throughout the season, there will be no great difficulty in keeping this pest in check, as it is not generally established, but is practically confined to the Stanthorpe district and two or three other parts of the Downs.

The fruit fly must be systematically fought by gathering and destroying all infected fruit. This is of especial importance in the Stanthorpe district, where it will do considerable injury to the later fruits unless every effort is made to stamp it out as soon as it makes its appearance. Fruit imported into this district from other parts of the State should be carefully examined, and, if found infected, should be at once destroyed, as there is no surer way of giving the pest a good start than by the introduction of infected fruit.

Young deciduous trees should receive their summer pruning where necessary. This pruning consists in the shortening back of long straggling growth, and the thinning out of superfluous wood. Its object is to keep the trees strong and symmetrical, and cause the development of fruit spurs along the main branches. The manner in which the pruning is carried out and the result of such treatment in the past can be noted by a visit to the State orchards at Hermitage or Westbrook. Such a visit will well repay any fruit-grower the trouble and expense of the journey to these farms, and will show better than any writing how the work should be carried out.

The budding of deciduous trees can be done now, the only elements necessary to success being that the bark runs freely, that the buds are plump and well developed, and are tied firmly into their places.

In the coastal districts the planting of pines and bananas may be continued if desired, but earlier planting is preferable, especially in the Southern parts of the State. Tropical fruits, such as mangoes, should be planted during the month, choosing dull moist days for the purpose. Mangoes can also be budded or grafted either by the method of plate budding described by Mr. Knight in the July number of the *Journal*, Vol. VII., p. 41, and Vol. VII., p. 256 (September), or by means of the saddle graft as described in the January number of the *Journal* for 1899.

All citrus fruits can also be budded, taking care to use plump, well-developed buds, and to see that the bark runs freely.

All young trees in the nursery should be kept well cultivated and free from weeds. They should be trained to a single stem, and staked where necessary. Seedling citrus stalks can be set out in the nursery row during seasonable weather.

There is usually a heavy growth of weeds and summer grass in the orchard during the month, so that every opportunity should be taken to keep them in check by means of the harrow or cultivator during dry weather, as, if this is neglected, they are apt to get out of hand during a wet spell. In the drier parts of the State the orchard should be kept well cultivated, and, where water is available for irrigation, citrus trees should receive a good soaking during the month, taking care to give the land a thorough cultivation as soon after the irrigation as it will stand working, as this tends to prevent the formation of a crust and to retain the moisture in the soil. In the Southern coastal districts mangoes and the main crop of pines will be ripening towards the end of the month, so that in the case of the former every precaution should be taken to prevent their destruction by fruit fly by the gathering and boiling of all fly-infected fruit of all kinds. The destruction of scale insects should be continued by either spraying or cyaniding; and where leaf-eating insects are troublesome, the same can easily be kept in check by spraying with arsenical washes, as recommended in the October number of the *Journal* for 1900.

Where it is proposed to plant orchards on new scrub land this is a good time to fell the scrub, letting it lie till late in the autumn or early winter, when it can be burnt off during dry bright weather. The clearing of forest land can also be continued, the land as stumped being sown with corn preparatory to its being planted with trees the following winter, as the working that the corn receives is a good preparation of the land for fruit.

Farm and Garden Notes for February.

Field.—During this month the land intended for potatoes should be ready for planting. Plant only small potatoes whole. If large potatoes are cut into setts, there is risk of their rotting, especially as the drought has now broken up and the usual wet weather may be expected with a hot, muggy atmosphere. Weeds will be very troublesome, and for that reason the sowing of lucerne should be deferred till later. Sow lucerne in deep, rich soil, thoroughly worked and deeply ploughed. Cape barley, panicum, Kafir corn, imphee, sorghum, and vetches may be sown, but it is risky to plant maize for a late crop, as early frosts would destroy the ripening grain. For an early winter crop sow Swede turnips and mangoldwurtzels.

Kitchen Garden.—Make preparation for good crops of vegetables for the early winter by ploughing or digging all unoccupied ground, supplying well-rotted manure if needed. Chicken guano is also an excellent fertiliser, prepared as follows:

Spread a layer of black soil on the ground; dump the fowl manure on to this, and pound it fine with the back of a spade; add hardwood ashes and plaster (gypsum), so that the compound shall contain the following proportions:—

Soil, 3 bushels; fowl manure, 2 bushels; ashes, 1 bushel; plaster $1\frac{1}{2}$ bushels. Mix thoroughly and a little before planting, moisten the heap with water, or better still with urine; cover with old mats and let it lie till needed.

Most market gardeners will have cabbage and cauliflowers ready for transplanting. Do this during the month. Read the article in this issue by Mr. Horniblow on growing cauliflowers in the Brisbane district, in which he

points out that the middle of January (now past) and the middle of March are the best times to sow the seed. Sow "Eclipse" or other large Asiatic variety. If the aphid appears, spray the plants with tobacco solution.

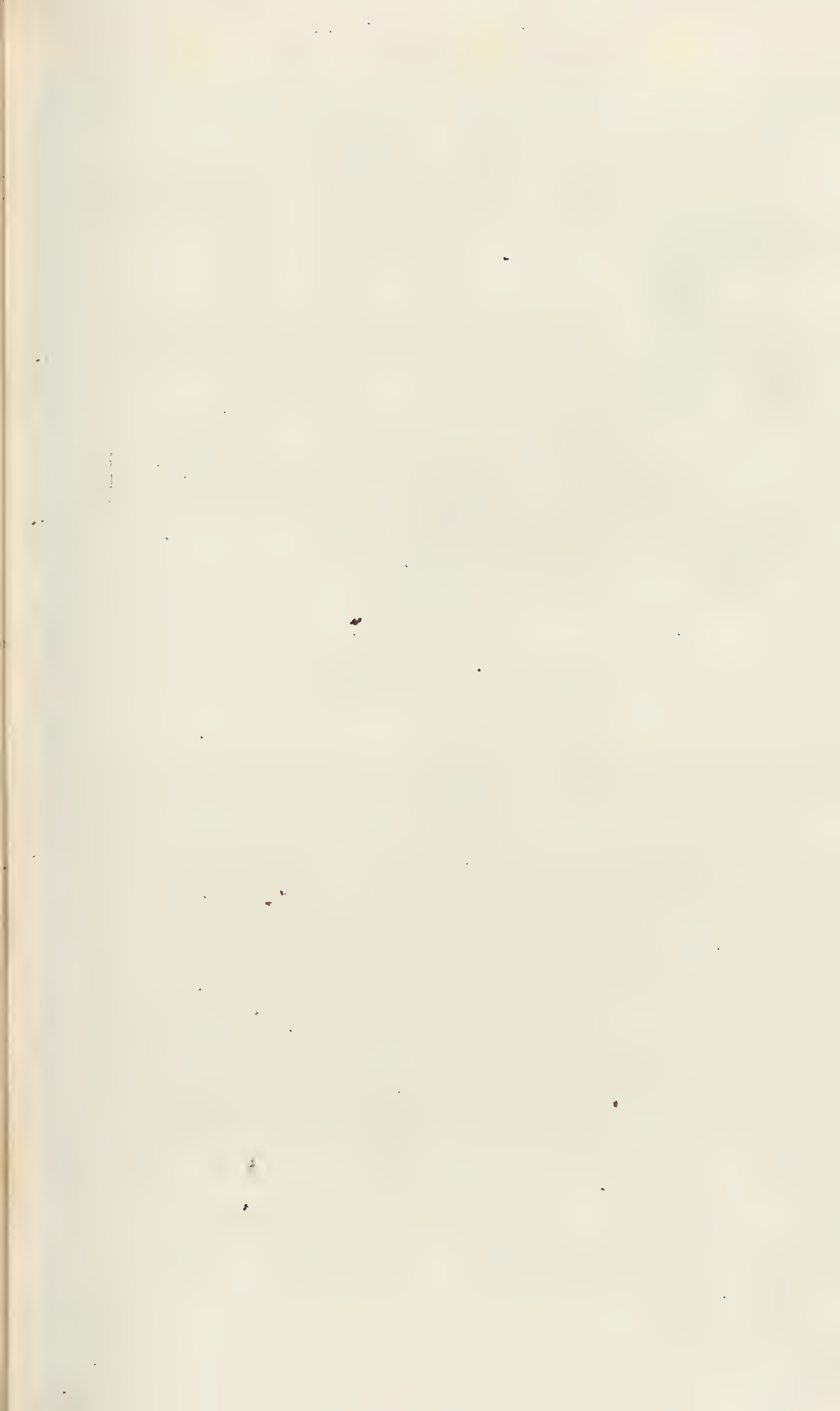
Sow French beans, butter beans, beet, carrot, turnip, radish, cabbages, cauliflowers, cress, peas. Should the weather be dry after January rains, give the plants a good soaking of water. Gather all fruit of cucumber, melon, French beans, and tomatoes, to ensure the continued productiveness of the vines.

Flower Garden.—Thin out and tie up dahlias. Keep the weeds down, never allow them to seed. Sow hardy annuals. This is the best month for sowing, as you will be able to keep up a succession of bloom during the succeeding months of autumn and winter. To ensure this, sow phlox, pansy, daisy, stocks, asters, nasturtium, hollyhock, candytuft, mignonette, sweet peas, dianthus, carnations, cornflower, summer chrysanthemums, verbenas, petunias, penstemons, &c. Dianthus sown now and planted out in March will bloom during the whole year if the dead stalks and blooms are regularly cut away.

Do not sow flower seeds too deep. On the depth will depend greatly what results you will have as regards the seed germinating. It is easy to remember that seeds should only be covered with fine soil to a depth equal to their own size—for instance, a sweet pea is about one-eighth of an inch in diameter, therefore cover it with one-eighth of an inch of soil.

Ex-Students of the Queensland Agricultural College.

A report has been received from Mr. John Mahon, Principal of the Queensland Agricultural College, showing the time spent at the College and the present occupation of ex-students. Eighty-seven students have passed through the College since Mr. Mahon first took charge as successor to Professor Shelton. Their terms of residence at the institution vary from two to three years, the latter being for the full course of study. Of these students, one is now assistant in Dr. Maxwell's laboratory at Bundaberg, one manages a cheese factory; there are four engaged in mixed farming, thirty-three carry on farming combined with dairying, one is manager of a creamery, another has charge of the gardens at the College. Eight follow pastoral pursuits and six are exclusively dairy farmers, five are in charge of butter factories, one is a farm manager, one has taken up fruit-growing, one is a chemist at a sugar-mill at Bundaberg. Three are engaged in commercial pursuits, one is an engineer, and the occupation of the others is not known. The above list is exclusive of those students who spent only one year at the College.





Agriculture.

HINTS FOR YOUNG FARMERS.

By THE EDITOR.

MAIZE.

As a farm crop, maize, or, as it is called in Queensland, corn, is grown all along the seaboard and on the tablelands of the State from one end to the other. It yields equally well in the tropical, sub-tropical, and temperate districts. A glance at the accompanying agricultural map will show that its cultivation extends from the 29th to the 16th parallel of latitude, between the 140th and 153rd degrees of longitude; in other words, maize is and can be successfully grown over an area nearly 800 miles broad and 600 miles long, which is equal to 480,000 square miles. The total area, however, under this crop only amounts to about 130,000 acres, yielding returns varying from 100 bushels per acre down to 20 bushels. Large quantities are cut for green fodder or for ensilage.

When maize is grown on newly burnt-off scrub land, the cultivation must naturally be done by hand labour for the first three years, owing to the innumerable stumps which require that time for the majority to rot out.

Having cleared off the fallen timber, the first business is to

SELECT THE SEED.

It has always been the custom of maize-growers to select the largest and flattest grains for seed purposes. Experience has long ago shown that if the round grains are sown the crop will turn out a poor one. I have made several experiments with such grains, and the results have, as a rule—not always—proved unsatisfactory. There is one point in connection with seed corn which is, perhaps, not generally known, and that is that the largest grains do not always necessarily produce a large plant. The size of the embryo plant within the seed bears no relation to the size of the grain. Of course it can be well understood that the larger the seed the more food material there is to enable the plant to resist adverse influences, and to enable the embryo to push its way up from a depth which would be fatal to a weaker germ, and also to enable the plants to withstand uncongenial conditions of soil or season at the early stage of growth. It often happens that small seeds contain larger or stronger embryos than large ones.

Golden King and Early Mastodon are the best varieties for excellence of grain and perfection of cob.

SOIL.

Maize delights in a rich, deep, friable soil with plenty of humus. The alluvial soils of the scrub lands and the rich, black, red and chocolate volcanic soils of the interior are admirably adapted to maize-growing. It is astonishing to what a depth the roots of the maize plant will penetrate. Experiments have been made which have proved that the roots will go down to a depth of 6 feet in search of nourishment and moisture.

PREPARATION OF THE LAND.

There are few plants which respond so generously to thorough tillage as the maize plant. On the rich, new scrub lands above mentioned, very little tillage is required. The cultivation consists mainly of keeping down the weeds. But when the plough can be used as on the wide, open plains of the

Downs country, or on scrub lands which have been cleared of stumps, deep ploughing (not less than 10 inches) should be done. Plough the land just about the beginning of winter. Allow it to lie in the rough, exposed to the influences of the sun, wind, rain, and frosts. Then, about a month before the planting season, say in September, cross-plough, harrow, roll, and generally reduce the soil to a fine, deep tilth.

TIME OF PLANTING.

There have been long discussions on this point, but nothing has practically come of them. In the nature of things, no general rule can possibly be laid down as to the planting time which will give the best results. Some say, plant early, plant in September. Others maintain the best yields may be expected from planting in November or December. The seasons and meteorological conditions are not the same in all districts, and even in a single district, and I will go so far as to say that on a single farm, conditions will so vary that whilst early planting will succeed on the eastern side late planting must be done on the western side. I never held much with planting in the "between" season. Late or early is more certain to give better returns. But no law can be laid down. Every farmer must suit his planting time to the conditions obtaining in his district and on his farm.

There is one advantage derived from planting at these different times; and that is, that the whole of the work of cultivation does not require to be done at the same time. One field can afford to wait whilst the first is being tilled.

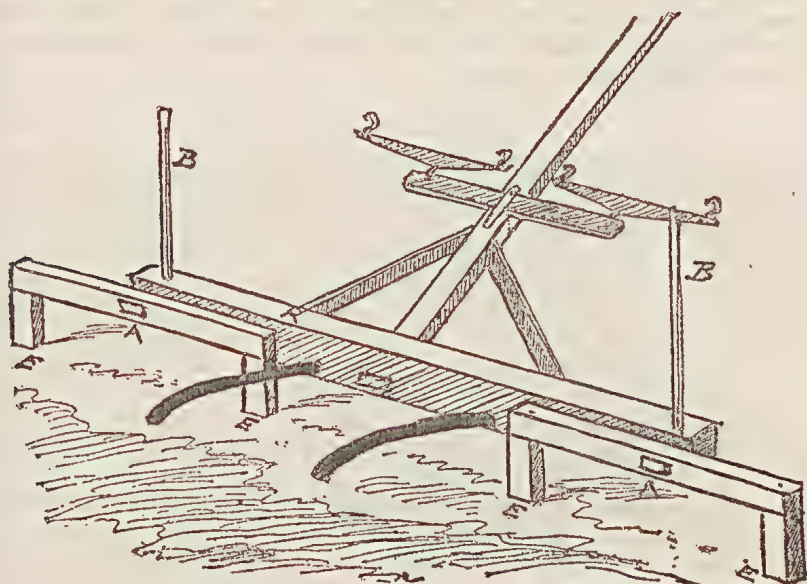
It has been questioned whether it is advisable to replant "misses," some holding that the resulting plants will be weakly, owing to their being overshadowed by the already fast-growing crop. When rainfall becomes alarmingly insufficient, however, pet theories, fine spun methods, and even thoroughbred seed amount to naught in the result, if the lack of moisture comes at the right, or rather the wrong, time. This, at the stage when the pollen is being formed, has a disastrous effect on the yield. If the drought continues, or is accompanied by warm, withering winds, what is called by corn-raisers a total failure follows. Cases have been known when, only a few days after the pollen was killed, a good rain was had, and followed up by others like it, yet the grain crop was past reviving.

To overcome this, a thoughtful farmer living in a district where disastrous droughts of two or three weeks' duration are liable to occur, shortly after corn cultivation ceases, conceived the idea of planting his corn at the usual time, then in about two weeks going in and planting about every fifteenth row double. These rows planted at a later date mature their pollen correspondingly later, and in case the earlier planting has its pollen killed by drought or heat the later planted rows will furnish enough to fertilise all in the field. The farmer in whose brain this idea originated tried the experiment last year, and is well pleased with the results, claiming that the idea in practice worked as well as in theory. Other farmers discussing the experiment claimed to have noted results equally as favourable in fields that were partially replanted on account of a poor stand. One instance has been reported where the farmer instructed his sons to go into the field and plant in every missing hill. This was done about two weeks after the main planting was done. The drought killed the pollen on the earlier planted corn, but rains came at the time the replanted hills began to scatter their pollen, and the whole field, or nearly the whole, was fertilised from it and made a crop, it is reported, 15 bushels to the acre in excess of other fields planted at the same time, but not so treated.

Before the advent of seed drills, maize was always dropped by hand into the hole or furrow—about three grains together. As soon as the plants were a couple of feet high, the plough was set to work and the plants were earthed up. This plan is not much adopted now.

The land is first marked out by means of a corn-marker. These implements are very simply constructed, and they lay off the field in long, parallel,

straight lines, which are afterwards or at the time followed by a single-furrow plough with a double mould board. I give here an illustration of a



useful corn-marker much used in America. This marker will adapt itself to any uneven or stony surface, and is constructed thus :

A bed-piece (R), 5 inches square and 10 feet long, is provided. The marker-holders (PP), 4 feet long and 4 inches square, are attached to the bed-piece by wooden pins 2 inches thick (AA). The markers (EE) are 10 inches long and 3 inches by 4 inches thick, and are fastened to the holders (PP) by 2-inch hobs near the ends. The markers are bevelled at the bottom to facilitate their passage over obstacles, and to enable a more distinct mark to be made. At (BB) are upright sticks 3 feet long, by which the marker is guided in a straight line by the driver. At the ends of rows, the marker is lifted round by the rear handles, which are shown black in the illustration.

If the seed is not sown by hand, the seed drill follows the marker, dropping the seeds at intervals of about 8 inches, and covering them with about 2 inches of soil. The seed drill is infinitely preferable to the plough, as the seeds are evenly covered, and lie comfortably at the bottom of the 6-inch furrow. The plants come up evenly, and, during the subsequent tillage operations, the soil gradually fills in the furrow, so that the plants are practically hilled up, although the land lies flat as before.

Nearly all farmers sow pumpkins in the corn drills, and, with good, rich soil, the practice is a very useful one, for you have two crops growing on the same ground requiring different plant food, and as the pumpkin vines spread they prevent the growth of weeds and keep the soil from baking in the hot sun after rain. The masses of leaf on the cornstalks repay the service of the pumpkin vines by shading them from the sun and by affording them a support to which the tendrils cling. Pumpkins should be sown in every fourth row from 15 to 20 feet apart.

The seed being sown, nothing now remains to be done but to keep the ground clean and well tilled until the pumpkin vines are so far grown as to interfere with the work.

Just before the stalk begins to turn yellow, the tops may be cut off above the cob for fodder purposes. This will not injure the crop, as the pollen from the flowerhead has long since performed its duty by fecundating the tassel of the cob, which now requires no more nourishment from it.

HARVESTING.

When the grain has set hard enough to resist the pressure of the thumb-nail, the crop is ready for harvesting. There are machines for harvesting corn, one of which I will describe directly. The generality of farmers pull their corn by hand, throwing the cobs into a dray which accompanies the pickers. Always pull corn in dry weather. If it is carried to the barn with rain-sodden husks, much loss will probably ensue, especially as husking is not often done at once. When fully ripe, the cobs will, as a rule, hang downwards, and this allows the rain to run off them without injuring the grain. If they remain upright, the upper grains will begin to shoot, and so much grain is lost, or is, at best, only fit for pig-food.

A machine called the Osbourne Columbia Corn Harvester, was introduced a few years ago at the Westbrook State Farm, and I believe it did good work. The machine was drawn by two horses walking on the left side of the row. Two sharp iron points pass close to the ground on both sides of the row, lifting any cornstalks which might happen to lie on the ground. The stalks are then seized and kept erect by hooks of a peculiar shape fixed on endless chains moving rapidly towards the back of the machine. The stalks are at the same time cut close to the ground by an ingenious combination of a V-shaped fixed knife with a moveable triangular knife, and carried further back into the gatherer. When there are enough of these to form a sheaf, a curved needle passes round and ties it in a somewhat similar manner to the tying arrangement in the reaper and binder, with the difference that the stalks and sheaves are always held in an upright position. A little curved knife cuts the twine automatically, and a simple device throws the bundle on the ground. A man following picks them up and stooks them in the field, where they are left until stalk and cobs are perfectly dry.

Stooking is very simply done, especially if the contrivance depicted in the August number of the *Queensland Agricultural Journal* (Vol. XI., page 110) is employed. This consists simply of a batten about 12 feet long, supported near the end on a fixed trestle. A bar about 5 feet long passes through the upper end of the batten about 3 feet from the end, the lower part of the batten rests upon the ground. The sheaves of corn are piled, leaning against each other in the four angles thus formed, with the butts of the stalks well spread out. The sheaves are then pressed closely together by means of a rope and an iron spindle. The tops are next firmly tied with a piece of cord. The tightening rope is removed, the batten and cross-bar withdrawn, and the stook stands firmly and so bound together that no rain can enter.

Stooking corn will probably come much into vogue, since the late disastrous drought has taught farmers the value of cornstalks as fodder for cattle. Formerly cornstalks were burnt off as so much useless rubbish. Drought, like other adversities, has its lesson to teach.

The corn harvester described above costs about £40, and hence it is unlikely that many farmers will purchase one. Mr. H. Tardent, late manager of Westbrook State Farm, says that it can cut 10 acres per day; that it makes the land ready for ploughing three or four weeks earlier than with the ordinary method of harvesting, and early enough for wheat-sowing. It saves 90 per cent. of the harvesting expenses.

Mr. Tardent himself invented an inexpensive machine, which is here illustrated. It will, he says, cut from 10 to 12 acres in a day with a single horse and a man to drive it. He claims that it would be of great value to the small farmer and to the dairyman for cutting greenstuff for the cows. Any farmer handy with tools can make it for himself, getting a couple of pieces of iron from the blacksmith. Its construction is thus described:—

Take a piece of hardwood 3 inches by 4 inches, 5 feet long. To this attach a hook on the front end to hang the swinglebar on. Then, about 6 inches from the end, fix a wheel from an old plough, and on the other end a pair of old plough handles. Now, take two pieces of hardwood 4 inches by 2 inches,

4 feet long, and fix them on both sides of the centre piece by means of strong hinges, situated about 1 foot from the front end, which will allow them to open and shut at will, as required, to cut rows standing at from 2 feet to 6 feet apart. Those side pieces are kept at the proper distance from each other by means of wooden cross pieces 2 inches by 2 inches, provided with a few holes and fixed by means of bolts, say, 1 foot from the back ends of the side pieces. They are then bolted together on the centre piece.

Now the machine is complete except for a knife and a bender, which are both fixed on the right-hand side wooden piece. There is nothing better for a knife than a piece of short, thick, scythe blade. It should pass through a cut in the wood in an open angle close to the back end of the right-hand side piece. It must not protrude more than 4 or 5 inches, otherwise it will drag the stuff along after it is cut.

The bender is a bar of $\frac{1}{2}$ -inch thick iron. Fix one end of it in a hole on the wood near the hinges, then bend it gradually upwards, outwards, and backwards until it is about 6 inches in front of the knife. Then pass it through the eye of another bar $\frac{3}{4}$ inch thick and 2 feet 6 inches high, firmly fixed in the wood, and then bend it gently for about 1 foot outward so that the bender forms also an open angle similar to the angle formed by the knife with the wooden piece it is fixed on, but about 6 inches in front of it.

The bender is the main piece of the corn-cutter, without which the implement will never work well. As you see by the form of the bar, it performs two different works. It first lifts gently any cornstalk which might happen to be bent down, and above all it bends slightly forwards and outwards all the stalks, which are then cut very easily. No other wheels are needed except the front one. A light horse can work the machine all day. No second knife must be fixed to the left side, for then the stalks will fall on to the next row among the standing crop. It will cut any sort of cane or sorghum planted in rows.

When your corn is thoroughly dry, cart it to the barn. The cobs are there pulled off, and the sheaves are built up into stacks.

As soon as husks, grain, and pith are quite dry, husking must begin. This is a very tedious business, and it can be entirely obviated by the use of one of the many machines which husk, shell, grade, winnow, clean, and bag the grain in one operation. Such a machine will turn out from 15 to 20 bags per hour at a cost of about $1\frac{1}{2}$ d. per bushel. The machines are made for either horse or steam power.

MAIZE SILAGE.

If you wish to convert your maize crop or part of it into silage, the corn must be cut a little earlier than is necessary for corn fodder; only, in this case, as soon as cut, the sheaves are taken to the silo, there cut into chaff in lengths varying from $\frac{1}{2}$ -inch to 1 inch, and delivered into the top of the silo by an elevator. The elevator is usually made of two endless, parallel chains, with wood laths across. As the chaffed maize reaches the top, it is delivered on the pointed top of a light frame of wood, made in the shape of a bell which spreads the fodder and causes it to fall round the inside of the silo, so that one man is sufficient in the building to level and tramp down evenly. When your silo is filled, a layer of chaffed straw is placed on top and watered. This soon mildews into an air-tight mass, and makes a very efficient covering. The old method of weighting the silage has been abandoned. Never cut maize for silage until the grain has reached the glazed stage.

TO CALCULATE THE NUMBER OF BUSHELS OF HUSKED MAIZE IN THE BARN.

The following rule will suffice:—

Two cubic feet of sound, dry corn in the cob make a bushel of shelled grain.

It remains to ascertain the number of cubic feet in the heap of corn. Measure the length, breadth, and height. Multiply these three measurements together. That gives the number of cubic feet. Divide by 2, and you have the number of bushels in the barn.

Example :

Say your barn is 20 feet long, 10 feet broad, and 8 feet high.

$$20 \times 10 \times 8 = 1,600 \text{ cubic feet.}$$

Divide 1,600 by 2, and the result, 800, is the number of bushels of grain.

MANURING.

Maize is a gross feeder, and demands very rich soil or heavy manuring. For the latter, apply after ploughing fine bone-dust and dried blood—about 3 cwt. per acre. Then, in the spring, when the young plants are up, top-dress with a mixture of 2 cwt. superphosphate and $1\frac{1}{2}$ cwt. sulphate of ammonia per acre; or you may use 3 cwt. of guano instead. Do not apply the whole at once, because the young plants cannot absorb it before, perhaps, heavy rains wash much of it away. Therefore, apply half to the young plants, and the remainder when they have grown larger.

LUCERNE.

Lucerne should never be sown in a shallow soil nor in any soil with a stiff, retentive subsoil. What the plant likes is a rich, friable loam of great depth through which the roots can penetrate to reach the natural moisture below.

On the very rich scrub soils of the coastal and inland districts, and on the deep black and red soils both above and below the Main Range of Queensland, the plant finds a congenial home, and in such localities is no more difficult to grow than cereals or potatoes, and it is certainly infinitely less trouble both to produce and harvest. On such lands, of which you know there are tens of thousands of acres in this wide State, there is abundant plant food such as lucerne loveth, and the great depth of soil, reaching in many instances, notably in riverine scrubs, to as much as 20 and 30 feet, enables its roots to penetrate to the same depth in search of moisture.

To succeed with lucerne it is absolutely necessary that the soil be thoroughly mixed and cultivated, and reduced to a very fine tilth. Never sow lucerne on newly broken-up land. Take off a crop or two of maize first. This will cause the land to be well worked and cultivated, and will clear it of a host of weeds and grasses which are injurious to the lucerne plant.

When preparing the land if it has a slightly retentive subsoil, a furrow should be turned in the usual way with one plough, and a second plough—without the mould board—should follow and break up the subsoil to a depth of 12 inches, but this subsoil must on no account be turned over, hence the removal of the mould board.

Now, set the usual implements to work and reduce the land to the finest possible tilth. You will readily see the necessity for this when you consider that in a single ounce of lucerne seed there are 12,600 seeds, and unless the land were thus reduced the little seeds would fail to germinate, because they would be buried under the rough clods. In choosing seed, choose the broad-leaved variety, and sow either broadcast or in drills. The latter is the best method, because it is far more troublesome to keep the young plants clean if sown broadcast. However clean your land may be when sown, weeds, many of them wind-borne, are bound to make their appearance before the young plants are strong enough to get away from them.

As to the quantity of seed to sow, experience has shown that 10 lb. is sufficient if broadcast, and from 5 lb. to 6 lb. if sown with the machine drill.

Make the drills 12 inches apart, and do not cover the seeds more than from one-eighth to one-quarter of an inch. The best results have been obtained at this depth.

When the plants are 2 or 3 inches high, you may run the harrows over the field, but where you have sown in drills the hoe is the better implement, as a certain amount of damage is done by the tines tearing out many of the young plants, and yet not effecting a good clearance of the weeds.

You can work the machine hoe until the plants are 6 or 8 inches high. After that they are able to fight their own battle.

It is a good plan at this time to mow the field, which will destroy any weeds in the drills before they have time to seed. Once the tap root has got hold of the soil, the plant will make headway against any weeds which may appear. Lucerne thus treated will stand for ten years, and may be cut six or eight times a year.

Sometimes the land becomes what is known as LUCERNE SICK, owing to the long continuance of the crop on the ground. What is then the best thing to be done? Give the land a rest for a couple of years. Either fallow a season and the following year take off a crop of potatoes or corn, after which you may again sow lucerne, or green fallow the land for two years, taking one crop of some cereal each year.

It is surprising what large crops of potatoes may be got from an old lucerne field. The humus formed by the fallen leaves of past years and the nitrogen collected by the plant leave the soil in excellent condition for potatoes.

Lucerne, like every other individual plant of the vegetable world, has its enemies, but they are few in comparison to those of some cereals, of fruit trees, and of kitchen vegetables.

The worst enemy is DODDER (*Cuscuta australis*). It was introduced nearly forty years ago with seed from New South Wales. Dodder is a kind of thread-like vine which creeps up the lucerne stems, twines round them, and, by means of small suckers or rootlets, feeds on the sap of the plants. If allowed to grow, the field rapidly assumes the appearance of green studded with large yellow rings of dead lucerne.

Although the main root of the dodder dies, the tendrils continue to spread in ever-increasing circular form, leaving behind them an area of destroyed plants.

As soon as the parasitical plant appears, it should be carefully dug out, lucerne and all, carted away and burnt. Care must be taken that no particle of dodder is dropped on the way, as the smallest bit will take root and grow.

A farmer told me that he got rid of dodder completely in the following manner:—The affected patches were cut as close to the ground as possible, and every particle of affected dodder and lucerne removed and destroyed by fire. The patches were then covered with a heavy mulch about 6 inches thick of dry grass. This effectually choked the dodder, but the lucerne grew through it. It was found not to be necessary to dig out the lucerne plants. When required to be mown, the mulch must, of course, be removed to prevent entanglement in the machine. The dodder was thus effectually got rid of, and five years had elapsed since he destroyed it, without any sign of its again appearing.

I mentioned above the depth to which lucerne roots will penetrate, but an authentic account of marvellous root growth is given by Mr. Chas. W. Irish, once chief of an irrigation enquiry commission in Nevada, United States of America. He was making a survey of a mining tunnel in that State, which had been driven through rotten porphyry rock. The tunnel was much shattered and seamed, and through the crevices in the rock in the roof water came out drop by drop, and through the same crevices came also the roots of plants. These were found to be lucerne roots, which came down from an old field of the plant over the tunnel through a depth of soil and rock of 129 feet.

WHEN LUCERNE IS MOST PROFITABLE TO BE CUT.

Even in times of plenty it is as well to harvest forage crops when they are most profitable. Now, lucerne is one of those crops which deteriorate most by age. It should therefore be cut before it reaches the woody stage, because at that stage—that is, when the bloom is off and the plant has seeded—if fed to stock in that state, it is productive of indigestion. The best time, then, to cut the crop is when the plants are about one-third in blossom, as they then afford the greatest amount of digestible matter with the least amount of woody fibre.

Lucerne will be improved by disk-harrowing, especially when much couch grass has grown amongst the crop and the lucerne looks thin. Set the disks at

as great an angle as possible, and harrow one way. Then, with the disks at the same angle, cross-harrow. This operation will thoroughly pulverise the soil, and you may think you have destroyed the lucerne. But a little thought will convince you that lucerne is not so easily destroyed. Think of the long root-growth which prevents the harrows from tearing out the plants. The crowns are cut, and as a consequence they branch out just in the same way as does a cabbage stalk left in the ground when the cabbage has been cut close to the leaves. The field will be ready for the mowing machine, if the weather is moist, much sooner than if you had not harrowed it, and the crop will be a heavy one. In America many farmers disk after every cutting. They use a harrow with very sharp 16-inch disks set at an angle just sufficient to turn the soil over. The harrow is usually weighted to make the disks split the crowns to a depth of 2 inches. The further advantages are that the roots of weeds and grass are all turned up to the sun and killed, leaving a clean field, and the finely pulverised soil makes a good mulch, preventing evaporation, which goes on very rapidly after cutting lucerne in a dry season.

THE BEST TIME TO SOW THE SEED

is April or May for two reasons. One is that the soil is still warmed by the autumn sun, and the other is that the weeds will no longer grow sufficiently luxuriantly to choke the young plants. If the sowing cannot be done before June, it is scarcely advisable to sow until the spring, say in September, when the sun begins to gain strength. The objection to this time is that the weeds also will take advantage of the increasing warmth of the soil, and will give you some trouble. Still, if the seed has been drilled in, the hoe can be used between the drills, and if genial showers occur, the young plants will quickly take hold of the soil, but do not expect them to root so well as those from the autumn sowing.

Lucerne is a very paying crop, and no farmer should neglect laying down as large an area of his land in lucerne as he can spare from his other cultivation.

Each cutting in a fair season should yield 2 tons of green plant. Six cuttings a year would give, then, 12 tons, equal to $3\frac{1}{2}$ tons of hay. Valuing the produce at 40s. per ton, the return is £7 per acre. Take from this the cost of ploughing, sowing, and hoeing (£1 10s.), and the cost of mowing and making $3\frac{1}{2}$ tons of hay, say, 15s., there remains a clear return of £4 15s. per acre, from which, of course, there remains to be deducted the cost of baling and freight to market.

After the first cutting there are no further cultivation expenses, so that £1 10s. may be added to the net proceeds, making £6 5s. per acre per annum.

Sheep or any other stock may be grazed on lucerne, provided proper precautions are observed. The plant is greedily eaten by the animals, but it produces a large amount of gas in their stomachs, consequently they get "blown," and there is risk of losing them. The best way to use lucerne for dairy stock is to "half-save" it, and feed it to them sparingly in this state.

MANURE FOR LUCERNE.

There are two elements in the shape of plant food which are more particularly necessary to the luxuriant growth of lucerne. These are PHOSPHORIC ACID and POTASH. Nitrogenous manures should not be applied; they are injurious to the crop. A top-dressing of gypsum produces excellent effects.

The above manures may be applied at two stages—i.e., at time of planting, and when grown.

I have said that lucerne demands a rich, deep soil. That is because it is a very hungry feeder. Now, if you apply superphosphate and potash, the plant will seize upon this food, but it will only take up exactly what it requires from day to day, and no more; consequently the manures will not be rapidly

exhausted, and an application every two years will suffice for its requirements, provided that the top-dressing is not neglected. This top-dressing should be applied broadcast to the growing crop and then harrowed in. The expenditure on these fertilisers is not great, but the results are often surprising.

In an article in *Dalgety's Review* I found the following analyses of two fertilisers proved to be suitable for lucerne, given in tabular form:—

When Applied.	Tricalci Phos. (soluble in water) per cent.	Tricalci Phos. (insoluble) per cent.	Ammonia.	Potash per cent.
At time of planting	12	19	Nil.	6
Top-dressing	25	Nil.	Nil.	7
For grass land other than lucerne	25	Nil.	2	1

These manures are known respectively as No. 18 and No. 11.

The cost of No. 18 is £4 10s. per ton, and of No. 11 £5 5s. per ton.

Of the former only 3 cwt. per acre are required, and of the latter 1 cwt. per acre.

It should be remembered that the fertiliser for grass land is unsuitable for lucerne crops, because grass demands nitrogen and lucerne does not. It is a fact that stock at once know the difference between the fertilised and unfertilised lucerne or grass, and if experiments were made—every other chain fertilised—you would see the stock preferring the fertilised crop, thus demonstrating the benefits resulting from the application of plant foods.

Not only do fertilisers provide richer food, but they also enable a larger quantity of stock to be carried on a very much smaller area. If applied to fattening paddocks, this system of manuring must prove of the greatest value.

Now, a word about

LUCERNE ENSILAGE.

Compare the three methods of handling lucerne—(a) in the stack, (b) in the barn, (c) in the form of ensilage.

Under the very best conditions, for every 100 lb. of feeding value as it exists in the green lucerne at the time of cutting, 75 lb. will be saved if the hay is well cured and stacked under good conditions; 86 lb. will be saved if put in a barn, and 90 lb. if made into good ensilage.

Lucerne can be put into the silo when cut during wet weather, and once there it is safe. When making the crop into ensilage, it should be cut into quarter-inch pieces. There will be less loss by 2 or 3 per cent. than if put in whole. If put up in the middle of summer, it should be raked and loaded as fast as it is cut. Two or three hours in the hot sun will make it too dry for ensilage.

SILAGE.

One of the earliest advocates of ensilage of green crops was M. Reihlen, of Stuttgart, Germany, and the first book ever published on the subject was written in 1877 by a French farmer, Auguste Goffart, and was entitled "Manual of the Culture and Siloing of Maize and other Green Crops." This book was the result of twenty-five years' study and practice of the problem by the author. He certainly was not the first man to invent the method of siloing green fodder, but, as he perfected it and applied it on a large scale, he may justly be called "The Father of Modern Silage." In 1876 the first silo was built in the United States. To-day there are probably nearly half-a-million in that country. We have often been asked the meaning of the word *silo*. It merely means any air-tight structure used for the preservation of fodder in a succulent condition.

The best forage plant for the silo is what we in Australia call corn—that is, maize.

In planting corn for a grain crop we plant thinly, because the plants require a great deal of light, sun heat, and moisture to properly develop the grain. When, however, we plant for the silo, we want to raise as heavy a crop of stalks and leaves as possible, and this can only be obtained by comparatively close planting. By close planting it must not be understood that sowing thick as the proverbial peas is meant. Too close planting like too thin planting will result in a decreased yield. Here is an experiment made in Connecticut, U.S.A., to prove this:—

White Dent Corn was planted on six $\frac{1}{20}$ -acre plats at the Connecticut Experiment Station, as follows:—One, two, and four stalks every 4 feet in the row; and two, four, and eight stalks to the foot.

YIELD OF FIELD-CURED CROP.

Plat.	Distance of Planting.	Gross Weight.	Dry Matter.	Water—Free Substance in.		
				Kernels.	Cobs.	Stover.
		lb.	lb.			
A	One stalk in 4 feet	168.0	104.3	50.5	11.8	42.0
B	Two stalks "	320.0	201.6	102.1	20.4	79.0
C	Four " "	457.5	307.2	145.3	32.1	129.8
D	Two stalks in 1 foot	491.0	317.6	105.4	21.1	191.1
E	Four " "	522.0	297.2	70.4	19.1	207.7
F	Eight " "	532.0	260.3	48.4	13.5	198.4

The highest yield of field-cured crop was obtained with the thickest planting, while most dry matter was obtained by growing two stalks to a foot. The highest yield of water-free kernels was at one stalk to a foot, and of stover at four stalks to a foot.

As the distance of planting decreased, the water content of the crop increased. Thus, at one stalk in 4 feet, the water content was 37.5 per cent.; at eight stalks in 1 foot it rose to 51 per cent.

Of course the conditions of moisture, temperature, and fertility of the land are not always exactly alike in any two succeeding years. Broadcasting is not to be recommended. More seed and more hand labour are required, and the plants do not reach full development, which results in a decreased yield. Lucerne will yield more food materials per acre than perhaps any other crop. Five or six cuttings, each yielding from 1 ton to 2½ tons per acre, are often obtained. Lucerne for the silo is best cut when in full bloom.

Sorghum, cow peas, and various kinds of beans make good silage. Professor Robertson, of Canada, has recommended Robertson's Ensilage Mixture for the silo; it is made of chaffed Indian corn, sunflower seed-heads, and horse beans in the proportion of 1 acre corn, $\frac{1}{2}$ -acre horse beans, and $\frac{1}{4}$ -acre sunflower. This furnishes a feed richer in flesh-forming substances (protein) than corn. This has been proved to be an excellent silage. Fifteen pounds of it are equal to 3 or 4 lb. of grain feeds.

It is surprising what a number of waste substances on a farm can be turned into excellent silage. Such are thistles, cabbage-leaves, potato-leaves, turnip-tops, leaves, sorrel, rag-weed, swamp grass, old corn stalks and straw, and weeds of nearly all kinds, none of which would otherwise be of any use except on a compost heap or for burning.

SILOS.

Now about silo buildings. What points have to be observed? The first consideration is that it must be air-tight. The process of siloing fodders is largely a series of fermentation processes. Bacteria (minute plants or germs) pass into the silo with the green fodder. Soon they begin to grow and multiply, favoured by the presence of air and an abundance of food materials. The activity of these bacteria is quickly shown by the increase of heat in the mass

and the formation of acid. The more air at the disposal of the bacteria, the further the fermentation processes will progress. Now the more air subsequent to filling the silo, which is admitted, the more the bacteria will increase, and consequently the more silage will be wasted. Then, if still more air be admitted, putrefactive bacteria are produced, and by their means rotten silage results. But if no further air is admitted, the bacteria will gradually die out, or else only such forms as are able to grow in the absence of oxygen will survive.

We take it, then, as an axiom that no silage fit to be eaten can be made in the presence of air; therefore, the silo must be air-tight, and the fodder must be so firmly packed into it that air is, as far as possible, excluded.

The next point is, that the walls of the silo must be perpendicular and smooth to allow of the fodder settling down uniformly. If one side is rough, the fodder will cling to it, and, not settling down with the rest, the surrounding silage will spoil.

Again, the walls must be solid. If they spring, on account of lateral pressure, air will be admitted with consequent decay and loss of silage. Now, touching the size of silos. This will entirely depend upon the quantity of stock the farmer has to feed. Suppose he has twenty-five cows to feed, he will require 40 lb. of silage per head daily, in addition to other food (the latter a necessity). He will probably feed the cows for six months at least. This will necessitate 180,000 lb. or 90 tons of silage. Allow 10 per cent. loss of silage in the silo. Then, if 90 tons are required, we must put 100 tons into the building. Corn silage will weigh from 30 lb. to 50 lb. per cubic foot, according to the depth in the silo from which it is taken, and the amount of moisture it contains. Take 40 lb. as the average weight of 1 cubic foot of corn silage. Then 1 ton of silage will take up 50 cubic feet, and 100 tons 5,000 cubic feet. If a rectangular (oblong) 100-ton silo is to be built, say, 12 by 14 feet, then it must have a height of 30 feet. If a square silo is wanted, it might be given the dimensions of 12 by 12 by 35 feet, or 13 by 13 by 30 feet. If a circular silo, and these are considered the best, because there are no corners to ram, the following dimensions will be about right:—Diameter, 16 feet; height, 25 feet. In the same way, a silo holding 200 tons of corn or clover silage may be built of the dimensions of 16 by 24 by 26 feet, 20 by 20 by 25 feet, or, if round, diameter, 25 feet; height, 32 feet. These figures are taken from a pamphlet by F. W. Woll, "A Book on Silage," from which the major part of this article is also taken.

We said that round silos are better than square or oblong ones; therefore, as the capacity—that is, the tonnage content—of the former is not so easily calculated as that of the former, we add a—

TABLE GIVING THE APPROXIMATE CAPACITY OF CYLINDRICAL SILOS FOR WELL-MATURED CORN SILAGE IN TONS.

Depth of Silo.	Inside Diameter of Silo.												
	10 ft.	12 ft.	14 ft.	15 ft.	16 ft.	18 ft.	20 ft.	21 ft.	22 ft.	23 ft.	24 ft.	25 ft.	26 ft.
20 feet	26	38	51	59	67	85	105	115	127	138	151	168	177
21 "	28	40	55	63	72	91	112	123	135	148	161	175	189
22 "	30	43	59	67	77	97	120	132	145	158	172	187	202
23 "	32	46	62	72	82	103	128	141	154	169	184	199	216
24 "	34	49	66	76	87	110	135	149	164	179	195	212	229
25 "	36	52	70	81	90	116	143	158	173	190	206	224	242
26 "	38	55	74	85	97	123	152	168	184	201	219	237	257
27 "	40	58	78	90	103	130	160	177	194	212	231	251	271
28 "	42	61	83	95	108	137	169	186	204	223	243	264	285
29 "	45	64	88	100	114	144	178	196	215	235	256	278	300
30 "	47	68	93	105	119	151	187	206	226	247	269	292	315
31 "	49	70	96	110	125	153	195	215	236	258	282	305	330
32 "	51	73	101	115	131	166	205	226	248	271	295	320	346

The following table will show at a glance how much silage is needed for dairy herds of from six to fifty head, the size of silo needed, and the amount of

land to be planted in corn in each case. The table is based on the assumption of an average feeding season of 180 days, and of a daily allowance of 40 lb. of silage per head:—

SIZE OF SILO NEEDED.

Number of Cows.	Estimated Consumption of Silage.	Size of Silo Needed.		Average Acres of Corn Needed	Number of Cows.	Estimated Consumption of Silage.	Size of Silo Needed.		Average Acres of Corn Needed.
	Tons.	Dia.	Height.			Tons.	Dia.	Height.	
6	20	9 x 20 10 x 16	}	1 to 2	30	108	13 x 38 14 x 34	}	8 to 9
9	30	10 x 22 11 x 20 10 x 29		2 to 3			15 x 30 16 x 28 17 x 26		
13	45	11 x 25 12 x 22 13 x 20	}	3 to 4	35	126	15 x 35 16 x 31 17 x 29	}	9 to 10
21	74	11 x 37 12 x 32 13 x 29		5 to 6	40	144	16 x 35 17 x 31 18 x 29		10 to 11
		15 x 24 16 x 22	}	...	45	162	18 x 32 19 x 29	}	11 to 12
25	90	12 x 38 13 x 33 14 x 30		6 to 7	50	180	17 x 38 18 x 34		12 to 13
		15 x 27 16 x 25	}						

POSITION OF THE SILO.

The location of a silo is a very important matter, and must be settled at the start.

Seeing that the feeding of silage is an everyday job, the nearer it is to the barn the better, and the doors should open into the barn. Still, care must be taken that the odours from the silo do not penetrate the milking-shed, because, as all dairymen know, milk is very sensitive to odours; hence silage should be fed *after* milking, not before, otherwise the milk will have a decided silage-flavour. But butter and cheese made from silage-flavoured milk will not take up the odour.

CONSTRUCTION OF THE SILO.

Usually silos have been built of square or oblong form, but it has been proved that a round silo is far preferable, there being no corners to ram.

Dr. Cherry, of the Victorian Department of Agriculture, supplies the following particulars of the method of building a silo 25 feet high with an inside diameter of 12 feet 4 inches. The cost is also given, but labour is not included:—

Materials.

16 stumps	...	...	2 feet long, 6 inches in diameter.
Hardwood	...	...	15 studs 12 feet 4 x 2
Do.	...	...	15 studs 15 feet 4 x 2
Do.	...	...	15 studs 15 feet 4 x 1½
Do.	...	...	15 studs 12 feet 4 x 1½
Do.	...	...	48 battens 15 feet 4 x 0½
Do.	...	...	8 plates 5 feet 9 x 3
T. and G. flooring	...	...	50 feet 6 x 1
Lining, spruce, or white deal	...	1,300 feet	9 x 6 out.

Cost of Above.

	£	s.	d.
Hardwood—700 feet superficial, at 10s.	...	3	10 0
Flooring	...	0	4 6
Lining—1,300 feet rim, at 8s.	...	5	4 0
Nails and tacks, say	...	0	6 6
Total	...	£9	5 0

If tarred paper is used for lining the inside, one roll of "P. and B. building paper" is suitable, the price varying from 13s. 6d. to £2, according to quality. If lined with sheet iron, 56 sheets 26 gauge, 6 x 3 plain, will be required, costing £5 15s. for black and £7 7s. for galvanised.

ERECTION OF THE SILO.

A site should be selected handy to the chaffcutter, and also, if possible, to the feeding-shed. There is no objection to having the silo sunk 4 feet or 5 feet below ground if the drainage is perfect, or a levelled recess on the slope of a hill is better still, as the chaffed fodder will not require to be elevated so high. Level a space at least 15 feet in diameter, take a lath 7 feet long, bore a hole in it 6 inches from one end, fix it to a centre stake. The end of the lath will then describe a circle 13 feet in diameter, which circle forms the outside line of the stumps. Fix the sixteen stumps at equal distances in this circle, about 2 feet 5 inches from centre to centre. Mark on the tops of the stumps a circle with a radius of 6 feet 4 inches, and fix the 9 x 8 plates in position, the middle of each plate coming flush to this circle, the ends projecting beyond it. When the plates are all in position, two circles with a radius of 6 feet 4 inches and 6 feet 2 inches should be marked on them. The 4 x 2 studs are then halved for 3 inches in length, and fixed about 15 inches apart, the plates being checked out to the 6-foot 4-inch line to take the end of each stud. The studs which take the port holes and elevator are fixed 18 inches apart. Care must be taken to keep the studs plumb both ways, as it is of importance that the silo is the same diameter at the top and the bottom. When a few of them are braced in position, commence by fixing on temporarily one or two pieces of the inside lining, and then nail the first batten 18 inches from the plate. As it will take three battens to go round the silo, the ends of each of these should overlap by at least one stud. The long and short studs are fixed alternately. When the battens are fixed to the height of 12 feet, the 4 x 1½ are nailed on to the studs, about 2 feet being allowed for the lap.

After the hoops are all in place, the inside lining should be commenced from the top, so that the hoops may be used to support the scaffolding. The iron may be fixed at the same time, but if paper is used this is best put on in vertical strips just before filling. The post-holes are made 18 inches square at intervals of 5 feet. The framing for the doors is made of 3 x 1 out of the T. and G., and the doors are made of a double thickness of the same material, the joints crossing with a thickness of tarred paper between. The doors are fixed in position as the silo is filled, and knocked back into the silo as it is emptied from the top. Great care must be taken that the joints exclude all air and water, as the ensilage is often damaged at these points. They are lined with paper or iron on the inside like the rest of the silo.

The materials specified above are the exact quantities required. A few extra 4 x 2 pieces are handy for the scaffold.

We have already described the method and cost of building an oblong silo in this *Journal*, so there is no need to repeat ourselves. The round silo has not yet taken hold in Queensland, although it is acknowledged to be the best of any. A correspondent of the *Orange Judd Farmer* furnishes the following information concerning such silos:—

Fifteen years' use of silos and silage in several States and under various conditions of climate has caused me both to study the construction of the silo and its filling. I find to-day that the greatest drawback to the adoption of the silo system is the supposed great cost of construction. I have used silos that cost 16s. per ton capacity to construct, and have used those that cost 2s. per ton capacity, and in one case content cost was as low as 1s. 3d. The cheap silo kept the silage just as well as those costing many times more money.

When we consider what constitutes a good silo, we have only three things to remember—good material, strength, and, last, perfect exclusion of air after silo is filled. The first-named—that is, good material—does not necessarily mean

brick, stone, cedar, redwood, or some other material that will cost a large sum both as to material and transportation, but something at hand, some local material or material that is reasonable in price. To illustrate: When I was in Eastern Tennessee, I found pines scattered through the hill lands, and on the streams were old-fashioned water-mills that would saw these pines into lumber very cheaply. So cheap were the pines and labour, that our 2 x 4's for silo construction cost but £1 per 1,000 feet. Silos constructed from this lumber were just as good as though constructed of California redwood worth £12 to £15 per 1,000 feet.

In building a silo, I consult local conditions. If in Texas, use Texas hard pine. If in western coast country, would use redwood or cedar, but in the central section of the United States I find nothing better than the ordinary 2 x 4's (white pine) of commerce, costing from £3 to £4 8s. per 1,000 feet. I have thoroughly tested this material in several States, and in no case has it proved defective in any one of the above-named qualifications—strength, durability, and perfect exclusion of air, together with simplicity of construction. Briefly as possible I will describe my method of construction.

The stave silo has been condemned by many, owing to its tendency to dry out when empty and then fall down. Silo manufacturers make capital of this defect in advertising their tongued and grooved method of preparing their staves, but they do not say what we must do when the tongue rots out in a short time and leaves their staves free to fall down. I have adopted a method which does away with any danger of staves falling down, and simplifies the construction to a marked degree. The silo I shall describe is the strongest building on the farm, and will withstand inside pressure or wind pressure as well as any style now in use—something well worth careful consideration.

To build a round silo of 2 x 4 stuff, get your lumber and have it dry and free from loose knots; see that edges are straight, so that when walls are up edges will touch evenly the entire height of silo. In a circle of 14 feet or more it is not necessary to bevel the lumber to fit the circle; it is better not to do so, because the lumber will dry out more quickly when the silage is removed, which tends to prolong the life of the silo by checking decay. In case beveling is done, don't bevel the entire stick's width, only take off bevel from centre of timber. This will leave other half slightly separated from its mate, giving air a chance to dry wood. To the novice an empty stave silo with its staves showing daylight shining through cracks from top to bottom is far from an airtight building, but one has only to tighten up hoops snug and go ahead and fill. A stave silo is like a leaky barrel. It only wants hoops driven tight to make it as tight as ever. While the silo has not hot water it has something just as effective—silage, which is 80 per cent. water or sap, and heats up to 180 degrees. Every crack is shut tight.

To build a stave silo first decide on size of silo, then get the material most abundant in your locality. Any lumber that will not warp is suitable. Have it dry, if possible. If your silo is to be above 20 feet in height, buy lumber of two lengths; for a 24-foot building get 14 and 10 feet stuff, or a 26-foot silo 12 and 14 feet lengths. Get your stuff on the ground during some dry, hot days, laying it closely, like a floor. Then take an old broom or a whitewash brush and a bucket of P. and B. paint and paint the lumber, not scrimping the amount. Let lie a day or so and then turn up another face of the lumber and again give it the paint. Continue until all sides and edges are painted. P. and B. paint is the best preservative of silo walls yet found.

While our lumber is drying we will put in silo foundation. We must decide where to build, and the best rule is to build just as near the animals' mouths as possible, to save work when feeding; at gable end of barn or shed is the best place. To lay foundation, drive a peg in centre of ground selected for foundation; take a fence board, bore a hole in end, slip over peg, then at half of distance of diameter of silo slip a pin or bolt that will mark ground as board is moved around. After this mark is made, set pin out as far as width of foundation trench is to be, which is about 16 or 18 inches. Now dig trench 18

to 20 inches deep; then fill up within 6 inches of top with small rocks, brickbats, or very coarse gravel. Over this pour thin cement. After this part of foundation is complete start wall 6 inches from outside of trench, leaving a 6-inch jog. That jog is to fool any rat that may wish to explore contents of silo. He will dig down to the concrete work and then stop, not knowing enough to follow the 6-inch step to outside of concrete. It is better to finish the narrower wall with flat rock or brick. Build up 8 or 10 inches above level ground. The dirt should then be thrown up against wall on outside, even with top of wall to turn water from building.

The inside circle or silo bottom should be of dirt only. Many people put down costly cement floors, only to find that a large amount of silage is spoiled each year. We do not know the cause, but we know that the last foot of 18 inches of silage on cement has a very offensive smell, and is not relished by cattle, while silage on dirt can be fed to the last basketful. I am speaking from sixteen years' experience when I make this statement. Have fed from many cement bottoms, always with the same result.

A sill is not necessary, but I always use one. To make the sill, take 10-inch width lumber 1 inch thick, and cut in segments, *c* of circle of wall; cut enough of these to make sill 3 or 4 inches thick; bed first in layer of mortar, then give a coat of gas tar, then lay on another course, breaking joints; nail down to lower layer. Continue laying, tarring and nailing until desired thickness is reached. We are now ready for the tarred staves or 2 x 4's. But you may wonder how to make a start, what to use for fastening hoops and silo with, and what to fasten staging to. To do all of this requires four timbers of hardwood, 4 by 6 inches in size, and as high as silo is to be, *b*. Before we put up these timbers, or we may say frame of our silo, we bore enough holes in these sticks to receive the hoops. These holes are in pairs, and are $2\frac{1}{2}$ inches from what will be the inside edge of silo. Holes are to be 3 inches apart long way of timber. Now we will lay off our circle, finding one-quarter of distance, where we stand one of these sticks, the inside edge flush with inside wall of silo, and becoming part of wall, and secure it by toenailing to sill. Then measuring another quarter distance set up another timber, continuing until we have the four up. We at same time brace these pieces well with fence boards or 2 x 4's, always keeping out of inside of silo.

After we have braced well, we set 2 x 4 pieces on outside of silo, opposite the 4 x 6 timbers, about 3 feet from them, or as wide as you wish to build scaffolding. Nail lumber from these 2 x 4's and 4 x 6 pieces, at intervals of about 8 feet, on which scaffold lumber is laid. A silo 25 feet high will require three of these stagings. Now we are ready to build or set up the staves. Three men or boys do first-rate. For this work the necessary tools are three hammers and plenty of 60-penny wire spikes; 40-penny will do in case 2 x 4's are scant—4 inches as they often are. Now set up one of the 2 x 4's edge against a 4 x 6 piece, and nail about every 4 feet; the men on different stagings will attend to nailing up to top of silo. Toenail the 2 x 4 stave to sill with 10-penny wire nails. Continue setting up and nailing. If the upper half of staves do not want to follow circle, strike on inside wall with heavy hammer, maul, or back of an axe, and the right curve will come.

After setting all staves to last 3 or 4 feet (and this space should be at place where doors are to be), make arrangements for doors. The doors, *d*, are only the walls of the silo cut on a bevel, and the pieces thus cut out nailed together with some barrel staves, the staves giving the short pieces the necessary curve to circle. The bevel must be on inside of silo, so that when doors are set the silage will press them into place. No frames for doors are necessary, and no fastenings or hinges. In cutting out the doors they should be numbered so they will be put in the same place each time. A door 20 inches by 2 feet is large enough. To cut out these places it is best to cut side bevel piece while the 2 x 4's are on the ground. To do this, bore a hole in centre of the 2 x 4 on right bevel and cut with a tenon saw far enough to allow larger saw to enter cut; when piece is cut out, tack in place with some small nails.

Now finish up silo walls, and then the man in silo will have to cut out the lower door in order to get out. If on outside, he can cut his way in. Doors must be about 3 feet apart to be handy in taking out silage.

The hoops for this silo should be of five-eighths round iron; each section of hoop should be long enough to pass through two of the 4 x 6 timbers, and threads should be cut 6 or 8 inches on each end of hoops so as to take up any shrinkage of silo. Large cast-iron washers are necessary to bear against the 4 x 6. Light washers will sink into the wood when the silo is full and pressure bears on hoops. Hoops should be placed as follows: First one near bottom of silo about 6 inches from sill; the next 2 feet higher, and each alternate hoop 6 inches higher than the last put on. This is for 18, 20, and 25 feet in diameter silos; smaller ones may use fewer hoops, and even one-half-inch hoops will answer. The roof of the silo can be built of boards, put on hip-roof style, or a shingled cone-shaped roof will do. Many have no roof. I have used silos without a roof, and saw no bad results.

FILLING THE SILO.

Having built our silo we now proceed to fill it with fodder grown for the purpose. The enormous quantity of maize fodder now available, owing to the unfortunate occurrence of the great heat waves of December and January, will furnish ample material for the purpose. It is not absolutely necessary to chaff the corn before putting it in the silo, but it is easier to fill in and packs closer than whole corn. Cut the plants into inch or half-inch lengths, and let the carrier deliver the corn as nearly as possible in the middle of the silo. Then let a man inside tramp it down hard, especially at the sides (and corners of an oblong silo). When enough corn has been put in to fill from 3 to 6 feet of the silo, the filling is discontinued and the mass allowed to heat up to 120 to 140 degrees Fahr. This will take a day or two. The filling in is then continued, and another layer of 3 feet or more filled in, which is left to heat as before. This method of intermittent filling is continued till the silo is full. Some farmers believe in rapid filling, but this has merely an advantage in the point of economy both of labour and food materials.

No weighting is required, yet no method will preserve all the silage intact. There is only one way in which the whole can be saved, and that is by beginning to feed the silage a few days after the silo has been filled.

It is useless to try and silo wilted fodder. The silo cannot restore to the dry fodder what it has lost, nor its original digestibility. The most it can effect is to render it more palatable and easier fed.

SOUR AND SWEET ENSILAGE.

The more water in the fodder, the higher the acidity of the silage and the lower the temperature.

The term *Sweet silage* is not a correct one, since all kinds of silage contain a quantity of acid. The so-called sweet silage, however, does not give off the strong acid odour of sour silage. Silage made at a temperature below 120 degrees Fahr. is sour silage, whilst between 120 and 130 degrees veins of sweet and sour are intermingled. At 150 degrees Fahr. sweet silage will be produced.

ALLORA SPRING WHEAT.

Some eighteen years ago, Mr. John Kelly, whose success in potato-growing at Allora obtained for him the title of the "Potato King," introduced a wheat of which he had obtained 1 oz. from Mr. Farrar, the celebrated wheat expert. This wheat was called Pugh's Rust-proof Californian. It succeeded well, and soon became well known as Kelly's Wheat. The name was then changed to Allora Spring, under which name it is known all over the Australian States.

About a year ago, Mr. G. Lockington, of the Dominion Milling Company, sent a number of samples of the best-known varieties of our Queensland wheats to *Milling*, an important English trade journal published in Liverpool. This is the report which Mr. Lockington received, and which we revive from the reprint in the *Toowoomba Chronicle* of May, 1902:—

THE WHEATS OF QUEENSLAND.

By a recent mail we received eight samples of wheat from the Dominion Milling Company, Limited, of Toowoomba, Queensland, and the following is a description of them by a practical miller to whom we submitted them for his opinion thereon:—

The eight samples of new crop Queensland wheat you kindly sent me have afforded much interest to all who have seen them. The opinion of myself and others is that the one marked "Allora Spring" was the best of the lot. In appearance it is rather like Carter's White Club, but it is very dry and rather ricey. Its value to-day (12th March) in Liverpool would be about 6s. 6d. per 100 lb. The second best sample, named "Indian Pearl," is a very hard wheat, but I could not say it is stronger than Allora Spring, as the sample was too small to test for strength, but better Australian wheats I have never seen, and the sooner Queensland can send us a supply the better millers will be pleased. The next in order of merit is that called "Tuscan," which is a very good sort, but it is partly red, the two former samples being white and yellow respectively. All three appear to me as much stronger than Victorians or South Australians. Defiance, the next in quality to approach the former in value, is also a fine wheat, and is both red and white. In shape it is rather like Golden Drop, a well-known English wheat, which is, of course, very dry. Budd's Early is the next in order of merit, and is something like Walla Walla in looks, though a little harder and probably stronger. Marshall's, another sample, is like the ordinary South Australians, being long in berry, inclined to thinness, and rather yellow. Ward's Prolific is the next in order of merit. It is like a poor thin sample of Walla Walla, and not a good sample at all. The sample of the least value was one named "Talavera"; although the grain was large and full, I had to put it last because it was badly weeviled. When not damaged it would rank equal with the Tuscan in value. The first four samples mentioned are all heavy wheats and flour-yielders, but the Allora Spring was the heaviest as well as the brightest and whitest. The wheat I am most interested in is the Indian Pearl, because such wheat should break up with as little break flour as No. 1 hard springs, and if its strength was anything approaching them it would be valuable to British millers.

It will be noticed the high grade in which these were placed. We may here point out that they were specially selected for the purpose—plump, sound grain of regular, even size, and perfectly free from barley, oats, &c. Probably not 25 per cent. of wheat grown would equal these samples, but Mr. Lockington is of opinion that, with careful selection of seed, preparation of ground, and then properly clean and grade the bulk, this percentage could be easily trebled, the whole system of preparing the wheat for market exhibiting too much carelessness.

Taking it as a whole, the opinion coincides with ours. The Allora Spring the English experts would naturally place first, as in Australian wheats they only look for colour and flavour, and not strength. We feel sure that our local growers will be pleased to have such an excellent report of their produce from such a high quarter.

To them all it offers great encouragement to persevere in their efforts to place on the market a first-class article, and which this opinion shows clearly can be done with care and judgment.

The price placed on the Allora Spring was equal to No. 1 Victorian. It was grown by Mr. Francis McLoughlin, Jondaryan, and we must congratulate him on the result.

With extended areas, good seasons, and increased yields, more wheat will be on the market from year to year, and we must emphasise the point that if we are to compete with the southern growers, as we must, and probably export in the near future, greater care in all departments of the farm must be exercised.

The opinion is of the utmost value to all growers of wheat in Queensland, and especially of the Darling Downs; and farmers owe a debt of gratitude to Mr. Lockington for the valuable services he has rendered them in obtaining such opinion.

FLAX CULTURE.

When it can be conclusively shown that any farm crop can be grown to a profit, it behoves farmers to look into the matter and see whether their soil and the climatic conditions are such as will enable them to grow that particular crop. If a farmer devotes the whole of his land to wheat or to corn and potatoes, he may, if the seasons are favourable, make a good thing out of his crops, and, in the case of wheat, with very little labour after the seed is sown. But given bad seasons, too wet or too dry, given insect pests such as caterpillars and locusts, which destroy certain crops, then it is that other crops, not susceptible to drought, not furnishing the particular food required by the insects, come in to tide him over a bad time. Amongst such crops we note Sisal hemp and flax, which both produce a fibre in great demand all over the world, and, in the case of the latter, a seed—linseed—which is worth about £12 a ton in addition to the fibre. The Sisal hemp plant thrives under any conditions except extreme wet underfoot. The longest drought has no injurious effect on it. Like the crickets, the hotter the weather the louder they chirp, and the better the fibre produced by the plant. We, however, only deal now with flax. Why not grow it? The fact is that few of our Queensland farmers have ever grown it or have seen it grown. But what about those farmers from the old country who have had to do with flax-growing from their youth? One would think that they would plant up a small area, knowing as they must do that Irish-grown flax has brought £52 per ton in the English market, and Victorian fibre has sold at £42 per ton in Melbourne, and the seed brought an additional 4s. 5d. per bushel to the farmer's bank account.

It has been conclusively proved that flax will thrive in Queensland, and produce fibre and seed equal to any European product.

A great advantage over the European growers is held by the Australian farmer.

In the old country flax is grown solely for seed or for fibre—never for both. Here a crop can be allowed to mature its seed, and splendid fibre for cordage can be produced from the same plants. Is it a question of scarcity of water? That need be no bar to flax-growing, because the plants can be laid out on the field and “dew retted.” That means that the dew and rain will ret the flax in about four or five weeks, and only one handling during that time is required—i.e., to turn it over. There is another matter in connection with harvesting the crop which gives the Australian grower a great advantage over the European farmer. The fibre only commences to enclose the plant at about 3 inches above the ground, so that the crop can be cut by the reaper and binder, instead of being pulled by hand, which naturally adds to the expense of harvesting.

It will now be asked: What does it cost per acre to sow and harvest flax, and what are the profits to be derived from it?

First, there is the cost of seed at the rate of $1\frac{1}{2}$ bushels per acre. That amounts to 6s. 9d.

Ploughing, harrowing, and sowing we may put at 13s. 6d. Weeding, pulling, carting, stacking, threshing, spreading out for retting, turning, and gathering will come to £3 15s. Breaking and scutching for 6 cwt. of fibre, per acre, £4 16s. Total, £9 11s. 3d. On the other hand, we have 6 cwt. of fibre at £2, 1 cwt. of tow at 10s., and 12 bushels of seed at 4s. 5d. Total,

£15 4s. The profit then is £5 12s. 9d. per acre, without any Government bonus as in Victoria, where the Government gave £2 per acre for all flax grown and £5 per ton on fibre manufactured. There is less trouble with a crop of flax than with a crop of maize, and it might be a standby when maize fails, as has been the case during last month. Where mixed farming is in vogue, flax should form one of the crops. Grown on deep, loamy soil, with abundance of vegetable matter, the crop is almost sure to succeed. Where manuring is necessary it should take the form of top-dressing—10 to 12 bushels of bone-dust per acre.

When flax is grown for fibre alone it should be pulled or cut after the plant has flowered and the seed partially come to maturity. Judgment must be exercised as to what constitutes the proper degree of ripeness. If too soon pulled, the fibre will be weak; if too ripe, it will be dry and coarse.

A writer in the *Agriculture Gazette*, London, says: The simplest method of judging is to try the flax daily by bisecting the capsule or bole. When the seeds change from milky colour to a greenish hue and are fairly firm, it is time to pull. Whatever is done, do not wait till the stalk strips at the root and turns yellow and the leaves fall off. The crop is then too ripe to give the best results. In pulling, catch the stalks just below the capsules, so that with one hand the longer stalks are gathered and with the other the shorter ones left. It is necessary to size them off thus, and keep the roots even in the sheaf. Make the sheaves small and equal. Do not set them up in windrows, but take them to the pond the day they are pulled, or at latest the day after, particularly in bright weather. The sun discolours green flax, and it will not be removed till it goes to the bleacher, who regards it as troublesome. The plant is deprived of its capsules on being pulled by what is known as rippling, which consists in drawing the head through the teeth of an iron comb about 8 inches in length, set upright on a form, across which two men sit opposite each other performing the operation alternately. A barn sheet is a convenient receptacle in which to catch the seed. It is very desirable to have the rippling proceeding simultaneously with the pulling. The plants thus treated should be tied in sheaves ready for steeping. The seed bolls should be dried in lofts, being frequently turned. When partially dry they are taken to a corn-mill and moderately heated on a kiln. The object of steeping is to separate the outer fibre from the interior pith. The adhesive mucilage is best softened in a pond. Do not oversteep, or the fibre is spoiled. The water in the pond should be clear and free of mineral contamination. The flax should not be crowded in. It should be placed root downwards. There are many minor recommendations about steeping, each affecting the quality of the flax, that cannot very well be given in reply to a query. Discolouration arises through various causes, such as iron-tinged water, which prudence demands should be first tested before being used for a large quantity. Water should not be run through the pond except very gently, and should only run out as an overflow. It is necessary to be very careful in the subsequent drying. Keep the stalks even, and do not break. Set the sheaves to drip when taken out, and afterwards spread even, and not too thickly. It is not advisable to keep it long thus spread—from three to five days. If these operations have been well carried out, no fire is required to dry. At all times it is desirable to avoid fire-drying. If put in the kiln in a damp state, it is burnt before it is dry. It is better when possible to keep such flax over till the ensuing spring or summer. If a crop is grown for fibre, from 2 to 2½ bushels per acre should be sown. If for seed, about 1½ bushels will be sufficient.

The Victorians are fully alive to the value of the flax crop, one farmer alone having about 200 acres under this crop. We in Queensland seem to fight shy of anything but corn and potatoes, and as for vegetables—a mine of wealth—we leave the growing of them to Chinamen. Is this as it should be? The soil and climate and rainfall of Queensland are all that can be desired, despite the late drought, which might occur in any country at intervals of, say, twenty years. If Englishmen would go in for market gardening and the growing of some crop in addition to the usual monotonous corn, they would be better off by far than at present.

AFTER THE DROUGHT.

Stockowners will be casting about to replenish their attenuated flocks and herds. Where nearly all sheep and cattle breeders have suffered alike from the effects of the great drought, the matter of restocking assumes an importance which cannot be overrated. Already oversea countries are on the lookout for orders from Australia, particularly for sheep, as will be seen from the following paragraph, which we take from the *Farmer and Stockbreeder* (Eng.):—

THE AUSTRALASIAN DEMAND FOR SHEEP.

We have not in recent years been accustomed to look upon the Australasian colonies as extensive buyers of pedigree stock. Recent events have, however, brought prominently before breeders the fact that even under the present depressing condition of affairs there is both a demand and inquiry for such stock in these colonies. The reports during the past month, together with some shipments, details of which have been kept private, must bring up the aggregate total exports of sheep to those colonies during the past month or six weeks to somewhere about 300 head. The fact that this demand has during the current year been in excess of that of any previous year is a matter of interest and importance. To fully realise the strength of the demand it is necessary to refer to a matter which of itself more than any other has in the immediate past hindered the expansion of this demand, and will continue to do so in the future—namely, the inordinate lengthened period of quarantine which is enforced against English-bred stud stock as a whole. Three months in the quarantine station, with all its attendant risk and expenses, is enough to stop any ordinary man from importing stock, and it has unquestionably done so in more than one instance; hence the recent increased demand becomes all the more notable and important. No reduction of the quarantine period has been secured, and the trade has improved at a period of exceptional drought and low price of wool. Despite the heavy expenditure incurred after arrival, and the shortness of keep and low price of wool, there is an increasing demand for more and more of the English mutton sheep. This is indicative of an alteration in the pastoral industry of these colonies, which have hitherto been practically wool first and mutton afterwards. Should this surmise prove to be correct, and every indication points that way, it is quite safe to assume that the demand, so large in excess of former years, will become still larger and important. With so many good omens, every effort should be made by the home breeders to give all possible encouragement. One way, and probably the most important of all, that such encouragement and help could be given will be to urge on by every means possible that time when this country can be declared free of sheep scab. Could this be accomplished, nearly one-third of the present expense incurred in the importation of sheep would be saved, as the period of quarantine could be so reduced that instead of three months, as under the present circumstances is claimed essential, one of very little more than the length of the voyage would provide every security against any possible infection.

REPORT ON WORK, QUEENSLAND AGRICULTURAL COLLEGE. DECEMBER, 1902.

In the early part of the month we had splendid rains, and all crops made remarkable growth, promising extraordinarily high yields; but it is much to be regretted that the severe hot winds and dry weather during the latter part of the month have caused a set-back to the early maize, and all hope of a good crop has passed. The rapid growth made by the crops in the early stage, and the excessive amount of moisture which they contained, clearly indicated that they could not endure even a short period of dry weather. Unless we get rain within the next few days, all our early maize crop will be useless for grain, and the silos are now being prepared to receive the crop should rain not fall. I also intend putting up a great portion of this maize in the form of compressed fodder—this can be done by chaffing the maize stalks and cobs into lengths of

about 2 inches, and then pressing by means of the Dederick hay-press. Another method by which the stalks could be readily and cheaply saved is by allowing the stalks to remain in the stooks until they reach a degree of dryness, in which they may be pressed into large bales by means of the ordinary lever hay-press. By this means the stuff retains a sufficient quantity of moisture to make the fodder palatable and easily digested.

Farm.—During the month all hands were kept exceedingly busy endeavouring to keep down weeds and other vegetation which made rapid growth in the crops; it was found impossible to do this effectually with the number of hands available, the students being absent on holiday for the greater part of the time. Plot No. 13 (9 acres) was planted with maize, as was also plot 5 containing 5 acres. The Argentine maize previously planted has made very poor growth compared with other varieties. Two scufflers were kept in constant use in the cornfields, and the corn has been hilled. Six acres of lucerne in garden paddock (plot 2) were cut and converted into hay; this when put over the weighbridge weighed 5 tons 10 cwt. The ploughing of the land in the Gatton paddock, which was recently cleared and fenced, was completed. Plots 1 and 10, farm paddock (5 acres each), were ploughed. 9,070 plants of *Paspalum dilatatum* grass were prepared and despatched to various parts of the State, making a total of 45,770 for the past two months, for which £34 11s. 2d. was received. These plants have been sent by parcels post as far as Cooktown, reaching their destination safely and in good growing condition. We have sufficient plants here to plant out thousands of acres. The grass is now 7 feet high, and ready for cutting for hay-making purposes. I have found paspalum to make excellent hay, and to be more relished by stock than even the best lucerne. After five years' trial of this grass, I can strongly recommend it as excellent for fodder or grazing purposes. Of course very heavy crops must not be expected from poor soil, although I have found it to thrive well on poor sandy soils. The rainfall for the month was 5.14 inches for nine days, the heaviest fall being on the 8th, 1.20; 9th, 1.28; 15th, 1.25; 17th, .60.

Dairy.—All our stock are now in splendid condition, and the yield of milk has increased twofold. We have now sufficient grass to keep four times the number of stock for at least three months. During the month we obtained 882 lb. of cheese from 840 gallons of milk, and 1,072 gallons yielded 466 lb. of butter; 144 gallons were supplied to the dining-hall, 62 gallons to College residents, and 250 gallons to calves, making a total of 2,368 gallons from 52 head. I have found right through the drought that the Ayrshire stock did best and put on more condition than other breeds when grass was available for them. The increase for the month was 3 Ayrshires, 1 Jersey, and 2 Shorthorns. Sales during month, 2 Ayrshire and 1 Shorthorn bulls. A reference to the tabulated milk yields will show that several of the Ayrshire cows have given really good returns.

Piggery.—We have a fine herd of 225 pigs on hand, including Berkshires, Yorkshires (large, middle, and small), Tamworths, and Crossbreds; for these a great demand exists. The increase for the month was 28 head of Berkshires. We disposed of, for stud purposes, 1 Berkshire boar and 8 sows, 3 Middle Yorkshire sows, 1 large Yorkshire boar; also, 20 mixed weaners. The principal foods used were skim milk, green maize, lucerne, pigweed, and waste refuse from the kitchen and garden.

Garden and Orchard.—In the garden, vineyards, and orchards very little work was done, owing to the want of labour. The vegetable garden is not in a creditable condition—in the first place, because of the damage done by the severe hailstorm; secondly, through scarcity of labour; and, thirdly, because of the rapid growth of weeds. A good deal of planting was done, but growth was retarded by weeds. It might be mentioned that just at a time when students' services are most needed on the farm, garden, and elsewhere the mid-summer recess occurs; this difficulty might be overcome by shortening the summer and lengthening the winter vacation.

Dairying.

THE DAIRY HERD.

QUEENSLAND AGRICULTURAL COLLEGE.

RETURNS FROM 1ST TO 31ST DECEMBER, 1902.

Name of Cow.	Breed.	Date of Calving.	Yield of Milk.	Per cent. Butter Fat, Babcock Test.	Commercial Butter.	Remarks.
			Lb.		Lb.	
Blink ...	Ayrshire...	28 April 1902	496	3.6	19.99	
Bonny ...	"	15 May "	618	3.6	24.91	
Laura ...	"	12 July "	716	3.6	28.86	
Renown ...	"	21 April "	605	3.7	25.07	
Ruby ...	"	24 July "	687	3.6	27.69	
Annie Laurie	"	10 Aug. "	680	3.7	28.17	
Laverock ...	"	14 Aug. "	720	3.7	29.83	
Lass ...	"	11 July "	746	3.5	29.24	
Lavina ...	"	5 Sept. "	826	3.5	32.37	
Linnett ...	"	10 Sept. "	804	3.6	32.41	
Lottie ...	"	17 June "	454	3.8	19.32	
Lowla ...	"	31 Oct. "	548	3.8	23.32	
Annie ...	"	1 Nov. "	560	3.6	22.57	
Ruth ...	"	2 Dec. "	621	3.5	24.34	
Rosebud ...	"	5 Dec. "	971	3.6	39.15	
Ivy ...	Jersey	24 Oct. "	602	4.0	26.96	
Playful ...	"	3 July "	614	4.0	27.50	
Stumpy ...	"	17 Mar. "	623	4.1	28.60	
Sweet ...	"	6 June "	307	4.4	15.12	With first calf
Carrie ...	"	15 Sept. "	642	4.2	30.19	
Eileen ...	"	"	545	4.0	24.41	
Jersey Belle	"	16 Dec. "	353	4.1	16.20	
Effie ...	"	25 Dec. "	124	3.9	5.41	
Damsel ...	Holstein	29 July "	627	3.3	23.17	
Mona ...	Holstein Shorthorn	3 June "	743	3.6	29.95	With first calf
Reanie ...	"	7 Mar. "	552	3.7	22.87	With first calf
Night ...	Holstein Devon	29 April "	461	3.8	19.92	With first calf
Alice ...	Grade Shorthorn	18 Jan. "	387	4.1	17.77	With first calf
Drone ...	"	12 May "	377	3.6	15.20	With first calf
Lily ...	"	22 Feb. "	207	4.2	9.73	With first calf
Lemon ...	"	18 June "	612	3.5	23.99	With first calf
Peggie ...	"	19 April "	478	3.8	20.34	
Princess ...	"	5 June "	488	3.7	21.30	With first calf
Restless ...	"	16 Mar. "	105	4.1	4.82	Dry, 20-12-02
Rowly ...	"	22 April "	501	3.7	20.76	With first calf
Cherry ...	Shorthorn	25 May "	88	4.4	4.33	Dry, 10-12-02
May ...	"	26 June "	489	3.9	21.35	
Nestor ...	"	31 July "	776	3.6	31.28	
Rose ...	"	10 April "	547	3.6	22.05	
Winnie ...	"	17 June "	520	3.8	22.13	With first calf
Guinea ...	"	9 June "	577	3.6	23.26	
Lucy ...	"	14 Aug. "	615	3.5	24.10	
Queenie ...	"	2 Sept. "	623	3.7	25.81	
Kit ...	"	27 Nov. "	722	3.8	30.72	
Violet ...	"	8 Dec. "	442	3.6	17.82	
Rosella ...	"	4 Dec. "	614	3.5	24.07	
Fancy ...	South Coast	19 Jan. "	525	3.9	22.93	
Topsy ...	"	4 Oct., 1901	527	3.6	21.24	With first calf
Grace ...	"	1 Sept., 1902	618	3.5	24.22	With first calf
Double ...	Grade Jersey	9 June "	98	4.2	4.60	Dry, 15-12-02
Brindle ...	"	6 June "	592	3.6	23.86	With first calf
Witch ...	"	13 May "	463	3.7	19.18	With first calf
Lady Rose...	Guernsey	26 Feb. "	89	5.4	5.38	Dry, 15-12-02

The herd was grazed on natural pasturage.

THE RED AND WHITE SWEDISH DAIRY CATTLE.

By H. WESTRING.

The Association of the Red and White Swedish Dairy Cattle is an enterprise of late years, having been first formed in 1891.

The object of this article is to give the Australian dairy farmers a description of the nature of this association, and to this end I think I cannot do better than give a few details of the history of dairy cattle in general in Sweden.

I must ask my readers to first follow me back to about sixty years ago. Before that time the dairying industry of Sweden was very little advanced, and cows were kept more for the sake of the manure than for the production of butter and cheese. Now, however, the agriculturists began to see that farming was only profitable in conjunction with more advanced dairying, and that quick measures must be taken to improve the qualities of the milking herds.

To succeed herein, two alternatives presented themselves: either to improve those already in the country through a judicious calling and selection of breeders, or through importation from other countries, purchasing such as it was desirable to introduce, and thus, through crossing, implant their good qualities in the offspring.

At the beginning of 1800 there existed in Sweden what one may call three different native breeds:—

1. Polled Highlands [Fjell-rasen], undoubtedly a reminiscent from a breed spread over Northern Europe in pre-historic times.
2. The Småland Forest Breed, with many points, from which one would infer a relationship to the Steppe cattle from Southern Europe.
3. The Large Skåne Estate Breed, similar to the brown cattle on the marches of the rivers Elbe and Weser.

To these one may add the Stromsholm, spread over the provinces round Lake Malaren, a fixed type, arrived at through the introduction of one cross with the Brown Holstein with following inbreeding. None of these breeds were altogether unsuitable for elimination, and one must regret that the last-mentioned breed was not in proper hands, as they, no doubt, would have served as very valuable material for further improvement. Instead of this, they were allowed to almost die out. The three firstnamed had such faults that it would have taken too long to improve them through inbreeding.

No wonder that importations from other countries thus were considered the only reliable remedy. Importations for the purpose of crossing the native cattle were not altogether a novelty; already, during 1700, cattle had been imported from the Elbe, Weser, Rehn, from Holstein and Denmark, but now, both through the Government and through private estate-owners, valuable herds were purchased in England—Shorthorn, Ayrshire, Angas, Galloway, Pembrokehire, and Devon, some to prove themselves wholly unsuitable, but others to give form, quiet development, and large milk yield for the offspring. But neither were breeds from the Continent forgotten, but more importations from the Elbe, Weser, Rehn, and Holstein, as well as from the Tyrol and Bavaria, were used in the experiment.

The word was passed: "Let us try everything and keep the best." Soon, however, Pembrokehire, Devon, Voigtland, Angas, Galloway, and Algauer dropped out, and left the Ayrshire, Shorthorn, and Holstein as the principal heroes of the battle.

During the years 1850-60 and 1870 very large importations of the last-mentioned breeds took place, and amongst these more Ayrshires both for Government stud herds and for private estates. Those Ayrshires were considered to have a "dip" of Shorthorn, which had given them the size and type very much sought for to improve the rather delicate constitution of the native cattle. And, indeed, the effect of those Ayrshires has shown the greatest results, and no doubt has laid the foundation of many of the best herds in Sweden.

Shorthorns [Yorkshire-Shorthorns] were also imported, although not in such large numbers as Ayrshires, and they were utilised not only for crossing with the native breeds, but also and principally to give more size and constitution to those already crossed with the Ayrshire. As a rule, only one such cross of Shorthorn seemed to be sufficient to obtain the required size and constitution. It is from such crosses between Ayrshires, Swedish Natives, and Shorthorns that such valuable cattle as Katrineberg, Wallaholm, Frosvidahls, Asmara, &c., were bred. Of these only Wallaholm is still in existence, but the others became extinct either owing to a continued crossing with Holsteins or to unsystematic and too close inbreeding.

As the Wallaholm cattle are the foundation of most of the best herds admitted in the herdbook of the above association, I hereunder give the history of same from Historiska Auleckningar, by Akerblom.

During the forties (1840) a herd of Katrineberg cattle was purchased for Wallaholm. The origin of the Katrineberg is as follows:—In 1670, a Lieutenant C. T. Prytz brought a herd of big red cattle, either of the Large Skane or Stromsholm, to the Degeberg Estate, where already a large herd of these cattle was established. They were purchased from Degeberg and brought to Katrineberg, where they were crossed with Shorthorns. At Wallaholm, the Katrineberg cattle were again crossed with Shorthorns, and thereafter, in the fifties, with Ayrshires. At the commencement the Wallaholm were almost entirely brown in colour, but now the red and white predominate. They were early noted for a great milk flow, for symmetry in form, and for large size. At one time they were numerous in the provinces of Västergötland, Nerike, and Sörmland. Many, however, disappeared, owing to too continued crossing, principally with Holsteins. At present, the most noted herds are to be found on the following estates:—Stjernerund, in the province of Nerike; Stjernerund, in the province of Delarne, Svana, Laxa, and Sahlsta, where they have developed into very valuable milkers. Particularly at the two Stjernerund estates have the Wallaholm cattle, through a careful and judicious inbreeding, with now and then an introduction of Shorthorn and Ayrshire blood, reached a type of development one is almost attempted to declare to be potent. When a number of these cattle were exhibited in Gothenburg in 1891, they received the highest praise and attention, being considered to be the very type of a Swedish national herd.

A great authority, Captain Bredberg, says, in his description of the exhibition: "At this exhibition we have, with the greatest pleasure, examined representatives in Gruppen from Stjernerund, Nerike, and Stjernerund, Delarne, which two herds bear witness to the high influence of Ayrshire and Shorthorn as material for improving our native milking breeds, and when amongst such herds, through judicious inbreeding, *potency* is proved, it would be desirable to get such herds declared a Swedish race."

Encouraged by such remarks, several estate-owners, with herds similar in type to those of Stjernerunds, proposed to form an association with the object of establishing a Swedish race of milk-breed. The promoters considered that the association should consist only of owners of such cattle as Stjernerund—cattle which, at one time or another, had been crossed with Shorthorns and Ayrshires, and which, through continued inbreeding, could claim uniformity and a certain degree of constancy (pre-potency) or power to transmit their qualities to their offspring. In proposed forms for regulations the promoters explain the purpose of the association to be: To establish a Red and White Swedish Race of milk-breed, through exchange of breeders, selection, and registration, without importation.

The addendum, without importation, caused much uneasiness, especially amongst those interested in a continued crossing with the Ayrshire [breeding in grades], and they would not admit that the establishment of a race as proposed would be possible, neither was it, in their opinion, wanted. At a large meeting at Katrineholm, 12th December, 1891, when the association was officially formed, it was strongly advocated by those breeding in grades that

importation of both Ayrshires and Shorthorns was absolutely necessary for a long time to come, and that it would be both unpractical and unwise to exclude those races from registration in the herdbook. Against this argument the promoters explained that they fully appreciated the two races as a material for improvement where the improvement was needed, but that the association intended to co-operate with owners of cattle with sufficient Ayrshire and Shorthorn blood to be of the type wanted, and, therefore, it was only necessary to make their qualities potent. However, the majority ruled that pedigree Ayrshires and Shorthorns should be accepted for registration. Thus, instead of one type, the association's type [Stjærnsund type], three main types had to be dealt with, viz.: Association type, Ayrshire type, and Shorthorn type, besides variations. As a consequence, the selection was more difficult to carry out, and the result more uncertain.

To minimise such undesirable consequences, and at the same time to take a step back in the original and right direction, the association at their general meeting, 1895, made the following alterations in the rules:—That any variation of type could only be admitted in the fourth class [the lowest].

The fourth class was, therefore, more to be considered as a class for observation, where experiments of crosses with Ayrshires and Shorthorns were allowed to exist, but from the third class upwards the fixed type was essential for registration.

Again in 1897 the promoters moved in the matter, and proposed that no bulls but those of the association type should be allowed registration, thus disqualifying purebred Ayrshires and Shorthorns, but that cows of more pronounced association type [than any other type] should be admitted in Class 4.

This proposal was now considered with more favour, and the following resolution was passed:—

- 1st. No animal could be qualified for registration unless unanimously voted for by all the members of the selection committee.
- 2nd. No animal with any points of Frisian, Dutch, Jenitland, or any other breed of similar unlikeness to the association type to be allowed registration.
- 3rd. Animals registered in Class 4 must be of "Association Type" or "more pronounced Association Type."
- 4th. In any other class except those of the association type.

By these alterations the promoters had the pleasure of seeing their original proposal accepted, viz.:—

"To co-operate herds of a certain fixed type, and, through exchange of breeds, selection, and registration, endeavour to make this type potent, and thus establish a race especially adapted to the country and to a high advanced agriculture—a breed characteristic of valuable dairy qualities, quiet development, and strong constitution."

Through the adoption of the last-mentioned rules it has, as was expected, been more difficult to get a sufficient amount of bulls with the necessary qualifications, the more so as one would not recommend others than those from old-established herds. The association had, however, a considerable supply from two such herds, the two Stjærnsund herds, of which the one in the province of Nerike is the most prominent.

As before mentioned, a herd of Wallaholm cattle was purchased for this estate, and bulls of the same breed were used. Since 1869, 70 bulls have been in service, and of these only 3 from other breeds to renew the blood—viz.: Nestor (Yorkshire-Shorthorn), purchased 1876; Windsor (York-Shorthorn), 1877; and Hero (Ayrshire), 1881. A herdbook has been kept since 1860, and from records therein we find that no progeny were used as breeders unless they had inherited the parents' high qualities, not only as regards productiveness, but also in points and constitution. We have thus such families as "Prima," "Bona," "Ulla," "Perla," and "Axelina," which,

generation after generation, have been splendid milkers. From these families also the most prominent bulls have been bred, which shows that the selection of bulls has been made with the greatest care and forethought, and that those who had the breeding in hand were already, years ago, fully aware of the importance of the selection for the future success of the herd.

MILKING RECORD OF ANCESTRY OF No. 82, HERO, 23 R.S.B.,* AND No. 81, HERO, 22 R.S.B.*

No. 82, Hero, 23.

Dam—Blomstra 13, average milk during 3 years ...	...	730 gallons
g d Blomstra 10	" " 5 " ...	620 "
g g d Blomstra 6	" " 5 " ...	600 "
g g g d Blomstra 3	" " 9 " ...	700 "
d Sire's d Boña 7	" " 10 " ...	770 "
d Sire's g d Boña	" " 1 " ...	1,010 "
Sire's d Beda 7	" " 6 " ...	665 "
g Sire's d Boña	" " 1 " ...	1,010 "

* R.S.B.=The Red and White Swedish Race.

No. 81, Hero, 22.

Dam—Ulla 13, average milk during 9 years ...	..	985 gallons
Sire's d Beda 7	" " 6 " ...	665 "
Sire's g d Beda 2	" " 8 " ...	650 "
g Sire's d Boña	" " 1 " ...	1,010 "

As a proof that this herd now deserves the name of milk-breed, the following yearly milking records are given :—

AVERAGE MILK PER COW PER YEAR [YOUNG AND OLD].

Year.	Gallon.	Year.	Gallon.	Year.	Gallon.	Year.	Gallon.	Year.	Gallon.
1879 ...	410	1883 ...	537	1887 ...	630	1891 ...	650	1895 ...	628
1880 ...	385	1884 ...	585	1888 ...	640	1892 ...	600	1896 ...	721
1881 ...	400	1885 ...	620	1889 ...	665	1893 ...	628	1897 ...	690
1882 ...	500	1886 ...	620	1890 ...	628	1894 ...	665	1898 ...	725

The herd has, since the cattle were first exhibited in 1891, received no less than eleven first prizes and twelve second, besides the special prize of 500 kronor from the Academy of Agriculture.

Since the foundation of the association the registration has been per year as follows from 105 herds :—

1892 ...	40 bulls	...	446 cows
1893 ...	21 "	...	337 "
1894 ...	13 "	...	145 "
1895 ...	25 "	...	284 "
1896 ...	10 "	...	105 "
1897 ...	15 "	...	167 "
1898 ...	9 "	...	133 "
1899 ...	10 "	...	164 "
1900 ...	10 "	...	197 "
1901 ...	32 "	...	428 "
Total	...	185 "	2,406 "

Representing the following classes :—

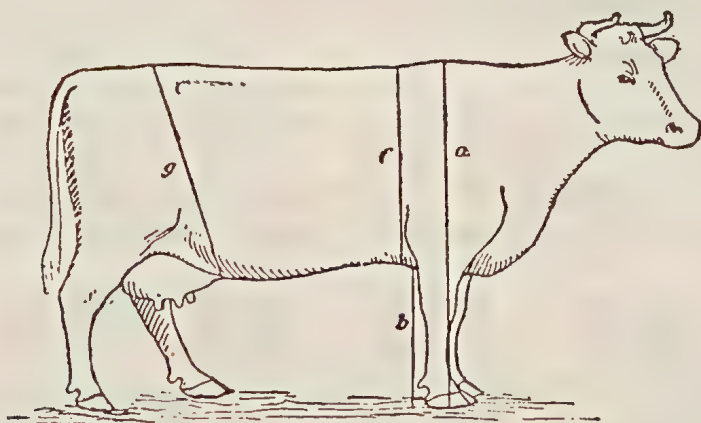
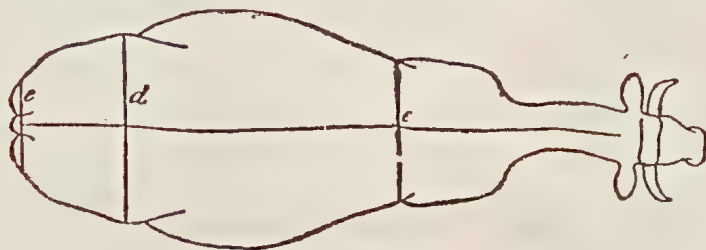
Class II.	3 bulls	...	6 cows
Class III.	50 "	...	376 "
Class IV.	132 "	...	2,024 "
Total	...	185 "	2,406 "

Cattle entered for registration, but disqualified, from 1892 to 1901:—173 bulls, 1,120 cows.

Accepted—Of bulls, 53·07 per cent.; of cows, 36·3 per cent.

From all the cows in the herdbook of 1900, I have found the average productiveness per cow per year to be: 673 gallons with 3·5 per cent. butter fat, or about 270 lb. of butter per cow; the highest yield is 100 gallons and lowest 520 gallons.

The average measurement of all the cattle admitted in the association:



	Bulls.		Cows.		Bulls.		Cows.
Line a:	133 centimeter	...	126 centimeter	...	Line e:	35 centimeter	32 centimeter
" b:	59 "	...	58 "	...	" f*:	198 "	179 "
" c:	47 "	...	41 "	...	" g†:	193 "	192 "
" d:	52 "	...	52 "	...			

*f=circumference of chest behind shoulder.

†g=circumference of body, taken behind hip joints and in front of udder.

1901.—The association consisted of fifty-six life members and seventy-six subscribing members.

RULES OF THE ASSOCIATION.

I.—The purpose of the association is, by systematic selection amongst the material already present in Sweden, to endeavour to produce a national red and white Swedish race of milk-breed, characteristic of high milk production and strong constitution, with broad and deep body throughout.

1. *Registration* in herdbook of no other animals than those of the association type.

2. *Exchange of breeders* amongst members.

II.—Any person paying the fee fixed by the association may become a member.

III.—Each member pays a fee of 5 kronor per year, or 100 kronor to become a life member. Registration fee per animal: 5 kronor for a bull and

for a cow ; 5 kronor for the first five years, 2 kronor for the next ten years, and 1 kronor for any following year.

IV.—The work is divided into districts.

V.—In each district is a committee of selectors appointed by the board of directors, and consists of two members and the secretary of the association, which three jointly inspect and select cattle for registration. This selection is done once a year, and any person, being a member, who wishes to enter any animals for registration shall notify the secretary of his intention before the end of March.

VI.—Each member of the committee of selectors receives 5 kronor per day and travelling expenses.

VII.—For registration in the herdbook, the following conditions are essential:—

1. All the members of the committee of selection must jointly approve.
2. The animal must be of the type fixed by the association.
3. Colour : Red and white, or red.
4. The certificate of a veterinary surgeon is required that there is no disease present.
5. Bull to be two years or over; cow to be proved to be of great productiveness, both as regards quantity and quality.

VIII.—When a member wishes to have an animal registered, he shall forward two printed forms, supplied by the secretary on application. When the animal has been approved for registration, one form will be returned with the animal's number in herdbook.

IX.—Each approved animal is branded with the association brand and the number of the class to which it belongs.

X.—The herdbook is divided into four classes—

- 1 class: Animals with ancestry of three generations.
- 2 " " " two "
- 3 " " " one "
- 4 " " approved of by the committee of selectors.

Only animals by parents of Class I., or with ancestry of four generations, are considered of pure red and white Swedish race.

XI.—The herdbook is kept by the secretary, and a yearly edition is supplied to each member free of cost. Each owner of a registered animal shall supply the secretary with a yearly record of productiveness, together with a veterinary surgeon's report of health. If sold, the name of the buyer; and if slaughtered, the reason therefor must be stated.

XII.—If the animal should, on inspection, be found to have tuberculosis it is taken off the herdbook.

XIII.—The association is managed by a board of directors, consisting of one member of each agricultural society supporting the association with funds, and an equal number of members. A member of the board is elected for four years, and any retiring member can be re-elected. The board elect the chairman and vice-chairman from amongst its members. The business is managed by a board of management consisting of the chairman, vice-chairman, and one member of the board of directors.

Duties of the board of management:—

1. To prepare any business for the board of directors.
2. To carry out anything that has been passed by the board of directors.
3. To fix place and time for meetings.
4. To prepare plan of tour for committee of selectors.

The board of directors shall hold at least one annual meeting, and other meetings as often as the board of management consider necessary.

The secretary and treasurer are appointed by the board of directors.

XIV.—The board of directors meet once a year and, if possible, in each district in turn; a collection of animals from that district where the meeting takes place and registered in the herd-book should, at such times, be exhibited.

XV.—Each member has one vote, which must be given in person.





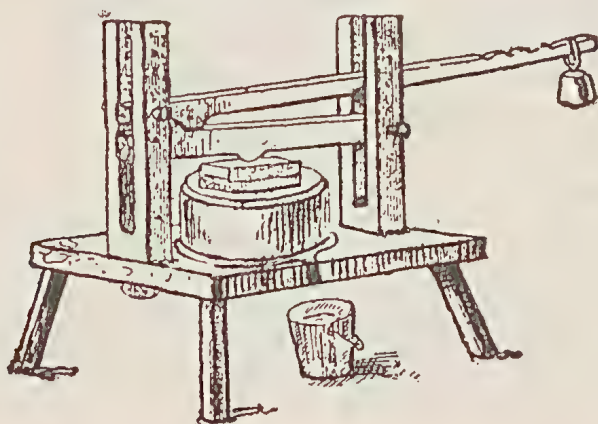


REFERENCES TO PLATES IX. AND X.

- 1.—R.S.B. 1490 : Adria 20, from Lyckås Estate. Class IV. Milk Record : 1900, 700 gallons.
- 2.—R.S.B. 1128 : Dam of No. 63, Yourk, R.S.B. 134, from Husby Herd. Class IV. Milk Record : 1900, 740 gallons ; 1899, 709 gallons.
- 3.—Group of cows from Husby Herd. 2nd prize, Exhibition at Gefle, 1901. Bull No. 63, Yourk.
- 4.—Group of heifers from Norrtorp. 1st prize, Exhibition at Gefle, 1901.
- 5.—R.S.B. 159 : 81, Hero 22, from Stjærnsund, Nerike. Class III. Gefle, 1901 : 1st prize, large silver medal and 200 kronors. Gefle, 1901 : 2nd prize, diploma and 250 kronors in group with heifers. Calved 1898.
- 6.—R.S.B. 160 : 82, Hero 23, from Stjærnsund, Nerike. Class II. Gefle, 1901 : 1st prize, large silver medal and 200 kronors. Gefle, 1901 : 1st prize, diploma and 300 kronors in group with cows. Calved 1898.
- 7.—No. 179 : Yourk, Ökna Estate. Class III. Calved 1892.
- 8.—R.S.B. 139 : Hero XII. from Norrtorp. Class III. Four years old.

HOME-MADE CHEESE.

In reply to a correspondent asking for details upon making a few cheeses for family use, also how to make the press, a practical correspondent of the *Leader* writes: Only the simplest utensils were employed by us in our initiatory efforts at cheese-making. Remodel a peck or half-bushel measure into dimensions suited to the quantity of milk at command. Small cheeses are to be recommended for beginners. If the necessary amount of milk cannot be obtained at one milking, choose a cool spell, and add the night's milk to the morning's. Place it in any vessel large enough—a large tin wash boiler answers every purpose—and add the rennet or a tablet, which can be had at most stores. A piece of rennet the size of the hand should be previously soaked overnight in a pint of water, and the whey thus formed added to the milk. Stir well until thoroughly incorporated with the milk. Heat up to about 84 degrees, or until the curd seems thick enough. Then remove from the fire and let stand until it "sets," or thorough coagulation takes place, after which the curd should be cut into small squares to allow the whey to escape. The whey should be of a greenish hue and nearly transparent, if treated right. A little experience or a few trials will be all that is needed to get the curd properly "set." If the whey seems milky, it denotes a deficiency of rennet or heat. Now dip off all the whey possible before removing the curd. Have ready a square of cheese cloth previously scalded and rinsed. Spread in a clean basket—the clothes basket will do if no other is at hand. Place this over a tub or any vessel large enough to catch the whey. Dip the curd from the boiler,



place it in the cheese cloth, and let drain for a while. Then with the hands break the curd up fine. Salt to taste, after which gather the cloth by the corners, shake well until settled in the centre of the cloth. Let out carefully and place in the hoop, which should be put where it is intended to be put to press. A clean board (square in shape, for convenience in handling) is placed under the hoop, which is bottomless, of course. A bench of any kind can be used to put the press on. (For press, see illustration.) Fold the cheese cloth evenly over the curd so as not to wrinkle, and place the "follower," or cover (a circular piece of wood made to fit the cheese hoop or form) over it. A small weight is best at first, afterwards changing to a heavier one. Let the curd remain at least twenty-four hours in press, turning once in that time. A clean wet cloth is used upon which to turn it. After taking from the press, set away until dry, after which rub with melted butter. Turn every day, and repeat the process of rubbing with melted butter for one week. Place a bandage around the side of the cheese, and keep it in a cool, dry, airy place secure from flies. A milk safe covered with gauze is just the place. Do not place in the cellar, as mould would soon form, unless the cellar be exceptionally dry and airy. A cheese weighing 10 lb. requires not less than five weeks to cure. A longer time ensures better flavour, or stronger, and is liked better by the majority of cheese-eaters. We never use any colouring matter to tone up our cheese, only pure milk and its cream.

PROFITABLE PIGS.

A correspondent asks us how he can get the greatest profit out of pigs. The first thing to do is to buy good stud pigs, by which we mean pigs which have a good record in their ancestors. If you buy a "pig in a poke" and take it on trust, however good-looking the animal may be, you may yet make a bad bargain. Therefore, in buying a purebred boar see that you get his pedigree. In the case of the sows, take care to get the stock from well-known breeders, great feeders, fast growers, and quick fatteners. Having started on right lines so far as your stock is concerned, you must now house and feed on right lines. If you build a log sty with a mud floor and a leaky roof or none at all, and if you pitch a few cobs of corn and a lock or two of green lucerne into the mud to be trampled under foot, if you sometimes pour some dirty swill into the trough and sometimes forget to water the pig at all, if you throw all sorts of rotten offal into the same trough, and call this housing and feeding your pigs, you deserve all you will get, and that is, miserable, lean animals, usually diseased and predisposed to swine fever and all other porcine diseases. And you will go on with this so-called feeding for twelve months or more, at the end of which time if any self-respecting bacon-curer should take pity on you and buy your pigs, you need not wonder that, instead of getting £3 or £4 each for them, you only get 15s. or, at most, £1. House your pigs comfortably. Look up the articles on pigs and their management in this *Journal*. Follow out the instructions there given, and you will then find that your pigs will be a source of much profit to you. On every well-equipped farm there should be, first, good shelter for the pigs, a fattening pen and yard, pens for sows with litters, sow and boar pens, and a good grass run. Good drainage is an absolute necessity, and, above all, the utmost cleanliness must be observed if swine fever is to be avoided. Green food, in the shape of lucerne, will put over 2 lb. per week of flesh on to a pig even when no grain is fed. When running at liberty and fed with corn in addition to greenstuff, pigs will make a gain of over 1 lb. per day, and only require 417 lb. of corn to make a gain of 100 lb. of flesh. The food of the breeding sow should be rich in bone and muscle-forming material. Skim milk, bran, pea, and oatmeal are excellent for building up the constitution. Brewers' grains where obtainable are also good. Keep the young pigs growing from the start on skim milk, bran, and maize meal, but very little of the latter and then only mixed with other food. Hog cholera has been proved to result



THOROUGHbred ANGORA, "FRISCO," 2 YEARS.

Recently imported from U.S.A. by Messrs. R. T. Blaxland and Son, Murinbin, Whittington,
New South Wales.

from heavy maize feeding ; 1 lb. maize to 1 quart of milk with a little bran added is an excellent ration for young pigs. Cooked potatoes can be profitably used. From 4 to 4½ lb. of potatoes are equal to 1 lb. of grain for pig-feeding. Bonemeal and wood ashes should also be supplied. They will save 28 per cent. of the food required to make 100 lb. of gain of live weight. Never feed more at a time than the animals can consume. It is better to keep them always keen for their food. Feed so as to carry your porkers up to a weight of 200 lb. in eight months. Follow out the instructions for the management of pigs given in eight numbers of the *Journal* for the year 1900 ; and if you cannot then make a profit on the pigs, there must be something radically wrong with the market.

ANGORA GOATS IN AUSTRALIA.

RECENT IMPORTATIONS FROM THE UNITED STATES.

Australasia is pre-eminently a sheep and cattle raising country, and possesses through its great variety of soil and climate—aridity and humidity, plains, tablelands, mountains, &c.—areas suitable for the successful breeding of every kind of stock. There is land in all parts of the Commonwealth as well suited for the raising of Angora goats as sheep, cattle, horses, &c., and there is no reason why the mohair industry should not be developed in Australia as extensively as in South Africa or the United States. It is unlikely that Angora goat-breeding will ever rank with those we have mentioned, but there is no reason why it should not take a place subsidiary to the larger industries. Indeed, there are many reasons why Angora goat-breeding and the production of mohair should add to the wealth of Australia.

MOHAIR AND GOAT SKINS VALUABLE COMMODITIES.

Mohair, like wool, is a world market commodity ; its sale does not depend upon a local demand, and mohair fabrics are in universal use. Goatskins, like sheepskins, calfskins, furred skins, and other station products are also world market commodities—that is to say, they are in an ever-growing demand, and can be sold either locally for home consumption or shipped to the markets of the world for foreign manufacture. Grade Angora skins are used as a substitute for kangaroo skins, and the quotations in the Sydney market are as follows : Large, 20 lb. and over to the dozen, 26s. to 33s. per dozen ; medium, 15 to 18 lb. to the dozen, 24s. to 27s. per dozen ; small, 12 lb. to the dozen, 15s. ; extra small, 6s. to 10s. ; faulty, 25 per cent. less. As to mohair itself, that ranges from coarse crossbred to fine turkey at from 7½d. to 20d. per lb. An American grower says that the first cross, or half-breds, scarcely cut enough to pay for shearing ; second cross, or three-quarter-bred, shear 1 to 1½ lb., worth 7½d. to 10d. per lb. ; third cross, or seven-eighth-bred, shear 2 to 3 lb., worth 11d. to 15d. per lb. ; fourth cross, or fifteen-sixteenth-bred, shear 3 to 5 lb., worth 15d. to 20d. per lb. He adds the important statement that the fourth cross, or fifteen-sixteenth-bred, is the lowest cross which should be used exclusively for mohair.

MEAT OF GOATS NOT YET POPULAR.

The only part of the Angora goat that is not at present in actual demand in large quantities locally or for the world's markets is the flesh ; not because the meat is not nutritious or delicious, especially when young, but simply because it has not yet found its way wholesale into the meat markets. Goat-flesh, like venison, is game, and principally the luxury of the home on which the goats have been raised. A plentiful supply of meat should popularise it and bring it into general use. Even if this were not so, the raising of Angora goats for mohair and the skins should be sufficiently profitable where conditions are peculiarly favourable in the Commonwealth. The "gamey" flavour of the

meat is due to the goat being more a browser than a grazer, and it is that characteristic that recommends the Angora for country not specially adapted for sheep, cattle, or horses.

KIND OF LAND FOR ANGORAS.

We all know that on innumerable holdings in all the States there are stretches of second or third class grazing land capable of improvement by goats browsing off the undergrowth—such as shrubs, suckers, seedlings, and so forth—that is useless for other kinds of stock. But there can be no successful or permanent raising of Angoras and growing of high-class mohair by merely using goats for improving poor grazing land. They need as much care in bringing to perfection of type as the finest merino. Moreover, all country is not suitable for Angoras any more than all country is not suitable for merinos. Moist climate and rich pastures, like on much land of the coastal rivers of Australia, are not suitable for Angoras. They thrive best in a warm, dry climate, but can stand both heat and cold without detriment. They are raised successfully in Central South Australia, and the mohair from the flocks is of first-class quality.

FRESH IMPORTATIONS OF ANGORAS.

Messrs. R. T. Blaxland and Son, of Murinbin, Broke, Patrick's Plains, New South Wales, have recently interested themselves in the raising of a flock, and quite lately added to it by importing a purebred buck and two does from the United States. This is the only importation of new Angora blood into New South Wales since 1875. The buck's name is Frisko, and the illustration is from a photograph taken of him the day after landing. It is expected that a few of Frisko's progeny will be available by purchase shortly after Christmas next.

The speediest mode of raising a flock of Angoras for mohair is by securing purebred Angora bucks, and crossing them with well-selected common does. Only white nannies should be mated to the pure Angora bucks, and the male progeny dealt with at two weeks old. Naturally, it would be better to start a flock with purebreds, for all the youngsters would then be of high value; but if limited capital is employed, then the common goat can be used for building up the flock by degrees, culling and grading being resorted to all along the line. In selecting does of the common goat they should have good frames, small heads, and short horns, short, smooth hair, and no long, coarse hairs on the thighs and forelegs below the shoulder. The advantages of starting by cross-breeding are that the common does are obtainable at a comparatively small cost, they are very prolific, and the kids are very hardy indeed.

MATURITY, WEANING, ETC.

Goats mature at about eighteen months, and, as any breeder of stock would know, they should not be allowed to breed till they have reached maturity. Kids should not be weaned till they are at least four and a-half months old unless they are very strong, nor should they remain with their mothers after they are five months old. This rule applies especially to buck kids, for they are prone to breed at six months of age, or even less.

When the does are about to kid they need special attention, and unless the kids are very carefully tended for the first week or two the percentage of loss is apt to be large. Kids are not so tough as lambs for the first two or three weeks, but as soon as they are able to run with the flock they are hardier. A small paddock is necessary for kidding. In the United States, breeders yard the does about to kid, and systematise the operations with much method. One system they call the "corral method," and the other the "staking method."

In the first place they so try to manage that the kids are dropped in sufficient numbers per day as to be handled properly. If the herd is a large one and, say, 1,000 head have to be tended, three men are in constant attendance. The season lasts between thirty and forty days, and during its height from seventy-five to 100 kids are dropped per day, and fortunately most of them come to light in the daytime.

THE CORRAL METHOD.

Describing the corral method, a Nevada breeder says: We have four or five small corrals fenced with 36-inch woven wire, and large enough to hold fifty does and their kids. The doe should be allowed plenty of room, because if too close to her neighbour she may adopt the other doe's kid. Besides these small corrals, two large ones are needed, each large enough to hold 1,000 does. Along the fence of one of these corrals are a dozen small pens, just large enough to hold a doe and a kid. At the gate of this large corral a jump-board is placed. This jump-board is intended to keep back those kids which are not large and strong enough to jump over it. A 2-inch board about 18 inches high will answer this purpose. Another device sometimes used is a platform open at the end so the kids may run under it, and thus avoid being trampled upon when the goats are going out over the platform. The small corrals may be made of panel fence, and located in a meadow where some feed is afforded. The does should always have some kind of feed at kidding time.

THE DAY'S WORK IN A CORRAL.

In the morning the flock is carefully examined, and all the does which show signs of kidding during the day should be separated and placed in one of the small corrals. The large flock is now turned out, and one of the men is sent with them with instructions to take the herd at once as far as he intends to go for feed that day, and then let them feed over a limited area and gradually work their way home. A few does will drop their kids on the range, and the herder should carefully note the number and their location. He should see that the herd does not feed around one of these does, as she is apt to leave her kid and join the flock, thus necessitating much extra work in finding the kid and in giving it to its mother. Early in the afternoon the flock is placed in one of the large corrals. Now the herder and another man go out with a wagon or on foot and carry the kids, gently driving the mothers. The kids should not be handled or rubbed against one another more than is necessary, as the doe knows her kid by the scent. These does are then placed in the small corral.

We now have one day's kidding in one of the small corrals. The does and kids should be watched to see that they are properly arranged. Do not bother them more than is absolutely necessary. Do not be in a hurry to make a doe own her kid. Do not drive the goats around one of the small pens.

AFTER THE KIDDING IS DONE.

The does should remain with their kids in the corral for a day or two at least, or until the kids are properly mothered. Any does which have not kidded should be taken out. The next morning any kids which may have been born during the night are put in another small corral with their mothers, as well as the does which are expected to kid during the day. The procedure of the previous day is repeated. In about three days, if one has limited quarters, the first day's mothers and kids may be put in the second large corral, that is the one with the jump-board at the gate. Now this wet flock is placed in charge of one of the men and sent out to feed. The gate is opened, the mothers passing out over the jump-board, and the kids remain in the corral. The herder must not range his goats near the does that are kidding on the range, and he should be cautioned to come in later than the dry flock, so as to avoid any possibility of their mixing.

FOSTER MOTHERS AND FOSTER KIDS.

When this flock arrives at the corral, the gate is opened, and each mother hunts for her kid. Some of the kids may not find their mothers; and if, after a day or two, there are a few unnourished kids and some does with over-distended udders, they should be placed together in the small pens along the side of the corral. The doe will own the kid in a day or two, whether she is its mother or not. The kids should not be allowed to become too weak before this is done. If one does not have enough small pens, a doe may be held while two or three kids suckle her, and thus tide them over until some of the small pens are vacant. The next day the second day's kidding is added to the wet flock. The wet flock thus gradually grows, while the dry flock decreases. During the day two men will be employed at herding the "dry" and "wet" flocks respectively, and the third man will be kept busy inspecting the kids, feeding the does in confinement, &c. If the weather is stormy, some of the kids will have to be sheltered.

CONCLUSIONS.

The corral method, in all its details, is hardly likely to be followed by Australians; still, there are many points given that may be modified and adopted to advantage. Angoras, like other goats, are great hustlers, and very destructive; fruit and other valuable trees need to be guarded against them. Of course, great skill is required to bring mohair to perfection, and, if any breeders take as much trouble with them as with sheep, Australian mohair should make a name for itself in the markets of the world.

WARTS ON CATTLE.

"Many breeders of show cattle are often troubled with warts growing in very conspicuous places on their prize animals," says Professor A. L. Cottrell, of the Agricultural Experiment Station in Kansas. "We had such trouble with the pure-blood stocks, and several successful methods were employed in their extermination. In order to experiment on taking off the warts a red poll heifer was selected on which the warts were so thick that it was impossible to place one's hand on her without its coming in contact with several large growths. We tried two different ways on different parts of the animal's body. On her head and shoulders we applied castor oil—well rubbed in—twice daily for a week. Shortly after each application a portion of the wart would scuff off, and in two weeks the warts were entirely cured without any pain to the animal in any respect. On the back and hips of the same heifer we used concentrated acetic acid, applying it with a fountain-pen filler, and soaking the wart up thoroughly, after applying grease around the root to keep the acid from eating the flesh. About twelve hours after the operation the warts could be pulled out easily. This was the quicker way, but caused considerable pain and irritation, and is accompanied by some danger of the acid being dropped upon the skin, and thereby causing trouble. Of the two methods the writer recommends the former, unless the time is limited and immediate results are desired. Dairy cattle are very commonly troubled with warts on their teats and udders, oftentimes producing nearly a deformity. This can be easily overcome by applying castor oil after each milking, and the wart is removed without causing any soreness or discomfit to the cow."

Poultry.

EXPERIMENTS IN ARTIFICIAL INCUBATION.

BY THE POULTRY EXPERT, Queensland Agricultural College.

In the first hatch, the incubator was run according to instructions sent with the machine, which is one of Ellis and Dobeson's "Patent Eclipse" incubators. The machine has both top and bottom ventilation, and the result was that only 20 per cent. of the fertile eggs hatched. I found on investigation that the chicks, or embryos, died at different stages of incubation, principally during the first ten days and up to the nineteenth day. The primary cause of this was too much ventilation, or, in other words, the rate of movement of the air in the egg chamber was too rapid, causing an excess of moisture to be evaporated from the eggs, the rest or movement of the air being of more importance than the difference in tension or degree of humidity as influencing the rate of evaporation, since evaporation is much slower in still air than in a current, the degree of humidity being the same.

In the second hatch, I corked up two-thirds of the top ventilators for the first ten days, leaving them open for the remainder of the hatch. This time I found that only 12 per cent. of the germs died during the first ten days; the remainder, during the period when the air was not excluded, died from the seventeenth to the nineteenth day. The result was 30 per cent. of the fertile eggs hatched, and, as most of the chicks died during the latter stages of incubation, I found that there was still too much ventilation during that period.

In the third hatch, I corked up two-thirds of the top ventilators during the first ten days, as in hatch 2, corking the remainder of the top ventilators for the last eleven days, with the exception of cutting out a small piece in four of the corks, two in front and two at the back. The result was that 50 per cent. of the fertile eggs hatched. This being a great improvement on the previous hatches, I decided to try another lot with the whole of the top ventilators closed during the whole period of incubation. The result was that 75 per cent. of the fertile eggs hatched; this I consider to be a very fair percentage. I may state that the machine was run at the same temperature for the four hatches—namely, 100 degrees to 101 degrees Fahr. for the first three days, and 102 degrees for the remainder of the time. Added moisture was supplied during the last three days in each hatch according to instructions sent with the machine.

It will be noted from the four results that top ventilation is really not necessary, and, if too much is employed, it is fatal to successful incubation. Should both top and bottom ventilation be employed, it would be necessary to supply added moisture in the moisture pan during the whole period of incubation; but, using the bottom ventilators only, it is not necessary except during the last two or three days, there being plenty of moisture in the egg to hatch it under normal conditions. The egg originally contains about 74 per cent. of water, but nearly the whole of this large amount is as essential to the development of the embryo as the solids are, water being a very large constituent of all parts of the body. It is evident, therefore, that if the supply of water is diminished by excessive transudation and evaporation the development of the embryo cannot go on. In natural incubation the eggs are surrounded by a mass of warm air held entangled and separated from the outside atmosphere by a porous septum of down and feathers which allow of a reciprocatory movement, or free interchange of the constituent gases and vapours of the inner and outer atmosphere; in other words, the air immediately in contact with the incubating body and eggs becomes warmed; in the gain of heat it expands, becomes lighter than the outside colder and denser air, and tends to flow outwards into the latter, which replaces it. Thus the atmospheric air surrounding the eggs is

being continually changed, diffusing gradually through the septum of down and feathers, so that there is no current of air as in an incubator with both top and bottom ventilation. The immediate effect of ventilating the egg chamber by means of openings in the walls is to increase the capacity of the incoming air to take up moisture by raising its temperature, and, with both top and bottom ventilation, the air passing in at the lower ventilators creates a current sufficient to carry along with it all vapour with which it may be charged. Mingling with the inner warm atmosphere, and coming in contact with the heating surfaces, it gains in temperature; this directly increases its capacity for taking up moisture. On reaching the maximum temperature it eventually passes through the top ventilators, carrying with it all the moisture it may have taken up; this process is continuous, and must cause dryness. Therefore, to be successful, it is necessary to prevent a current of air as much as possible, but, where both top and bottom ventilation are employed, the circulation of air in the chamber is the most rapid; with the latter only, it is slowest. Also, the more rapid the movement of the air, the more rapid will be the evaporation, with the same degree of humidity, and the lower the temperature of the outside air the more rapid will be the rate of movement of the air in the chamber, so that in cold dry weather less ventilation is required than in warm weather. In a very moist climate a little more ventilation would be required than in a dry one, but all that is really necessary is just sufficient to keep the air of the chamber respirably pure. The best guide as to whether there has been too much moisture evaporated from the egg is the air cell. In a normal development the chick will occupy about five-sixths of the space within the shell. If you break an egg about the eighteenth day and find that the membrane separating the chick from the air space at the broad end of the egg is clear white, dry to the touch, and binding the chick firmly in the small end, the head being closely pressed under its wing, and the feathers nearly dry, water heated to 120 degrees Fahr. should be put in the moisture pan to bring the chickens to maturity. In a normal development the inner membrane of the air space should have a dark fringe and feel soft to the touch, the head loosely pressed under the wing, and the feathers nice and moist.

The fatal effect of a rapid evaporation is to be found in the drying of the enclosing membrane of the eggs, or, in other words, the membrane covering the ovum becomes too dry to take up enough oxygen to suffice for the development and vital activity of the embryo, for while most animal membranes allow the exchange of carbon dioxide and oxygen to be effected with perfect ease, offering no serious impediment to the passage of either gas, dry membranes are impermeable to gases.

Although the drying of the covering membranes often cuts short the development of the embryo, and the germs die at different stages of incubation, this most frequently takes place from the above cause from the seventeenth day to the end of the term, the greatest number dying about the eighteenth or nineteenth day.

INDIAN GAME FOWLS.

A few years ago this breed was causing a small "boom" in this State, but it gradually died out, leaving the breed to take its proper position in the poultry yard. It is a good table fowl, having an abundance of choice breast meat of nice flavour and grain. As layers the hens are not good, and would be worthless to farmers for egg-production.* The Indian Game of "to-day" is a valuable bird for crossing purposes, the Indian Game-Dorking cross being the most fancied. I have had splendid results from crossing Indian Game with Wyandottes, Langshans, and light Brahmas. The last takes longer to mature, but you get a heavier bird, and a fine large breast to cut at if the birds have been mated judiciously.

* They are layers of large brown eggs, and the hen makes a good sitter and mother, and the chicks are very hardy.

SCHEDULE FOR JUDGING INDIAN GAME.

CHARACTERISTICS OF COCK.

Head and Neck.—Head rather long and stout, denoting strength, slightly heavy browed, but not beetling or scowling, skull fairly broad. Neck, nice medium length and nicely arched.

Beak.—Yellow striped, with horn colour, extra strong and a trifle curved, stout at base, giving the head a powerful appearance.

Face.—Smooth and fine in texture, throat and face being dotted with small feathers.

Comb.—If undubbed, pea or triple, small, and well set on the head.

Ear Lobes and Wattles.—Rather small and of a rich bright red in colour.

Eyes.—Pearl or yellow, bright and full in expression.

Hackle.—Short, but sufficient to cover the base of the neck, but not flowing over the shoulders.

General Shape.—Body round, muscular and stout, wide at shoulders, with wing butts showing prominent, body tapering towards the tail.

Back.—Broad and flat, but not hollow between the shoulder-blades.

Breast.—Wide, deep, prominent, and well rounded.

Wings.—Short, well tucked up, and carried high in front.

Legs.—Strong and thick, with well-rounded and muscular thighs of medium length.

Shanks.—Medium length and well scaled.

Toes and Nails.—Toes of good length, well spread, the hind toes well extended and flat on the ground, nails neat and well finished.

Tail.—Medium length, with plenty of side sickles and coverts, the tail carried slightly drooping and fairly close.

Carriage.—Upright, commanding, and courageous, the back showing a good incline towards the tail.

General Appearance.—Powerful, sprightly, active, and vigorous.

Colour.—Breast, body, thighs, and tail a bright, glossy, greenish-black; neck-hackle and saddle-hackle, glossy green-black, with a deep crimson shaft and centre to each feather; back, shoulder coverts and wing bows, glossy green black, slightly intermixed with dark crimson; wing bars, bright, glossy greenish-black; wing secondaries, when closed, deep bay.

THE HEN

Is similar to the cock in all points, making allowance for difference of sex, thus appearing more cobby and compact. The ground colour of the body is a lovely bright golden bay, each and every feather being laced accurately with metallic glossy green-black, as if embossed. This lacing may be single or double, in the latter case the lacing showing a clear margin between of golden bay, the lacing following the contour of the feather, the shafts of the feathers running a trifle lighter bay towards the base, merging gradually into the ground colour. The neck hackle and main feathers of the tail are as black as possible, the hackle having a brilliant greenish sheen.

Weight.—9 to 12 lb., or more, if symmetry is not sacrificed. Hens, 7 to 9 lb.—*Station, Farm, and Garden.*

GREEN BONE AS AN EGG FOOD.

We have persistently held forth to poultry-breeders on the value of green bone for the production of eggs, yet we have only seen two green bone-mills on farms. Hundreds of people are to-day complaining that their fowls are not laying well. That is certainly not the fault of the hens, but it is due to the carelessness of the hens' owners. They know, or at least they ought to know

after repeated lessons, that certain food produces certain effects. Yet they will persist in feeding laying hens on whole maize—no meat, no bone, no change of food—and then they wonder why the eggs are scarce. We commend to their notice the following article on Green Bone as an Egg Food, which we take from the *Journal of Agriculture of Western Australia* :—

Leading authorities agree that green bone is the best egg-producing food known. It is not an artificial stimulant like some preparations which force hens to lay for a time. On the contrary, it is food which contains every element necessary for the greatest number of healthy nutritious eggs. A powder which merely forces the hen to lay cannot add to quality, and it is merely a question of time when the fowl will break down under the drain on the vital forces. Many poultry-keepers have killed fowls through ignorance of scientific feeding by this forcing process. They killed the goose that laid the golden egg because they did not understand the laws of production. What is wanted is a thorough knowledge of the food that makes the most eggs, for a healthy hen with a full supply of egg material must by Nature's laws become a steady producer.

Green bones—that is, bones fresh from the butcher—cannot be surpassed as poultry food; they are easily procured, are much cheaper than meat, and contain a large proportion of the elements that enter into the composition of eggs than any other material, as they are more concentrated. Ground dry bones have long been on the market as poultry food, and they have served the purpose intended; but while the poultrymen and farmers were resorting to the use of dry bones they also witnessed the waste of much better and far more valuable food every day, in the shape of more nutritious, more digestible, and more highly relished fresh green bones, simply because there was no method known by which the tough green bones could be reduced to a condition to render them acceptable to poultry. But, with the advent of the green-bone cutter, all this valuable material can now be made to form a portion of the food for poultry. The old-fashioned bone-mill grinds the hard, dry, brittle bones, but it is unserviceable in reducing green fresh bones, as green bones cannot be ground; the modern bone-cutter, therefore, has come to supply a long-felt want, and ought to be extensively taken advantage of. These appliances can be obtained from several firms in Perth, and repay their cost without the least difficulty.

What is the difference between the green fresh bones from the butcher and those that have become hard and dry? Though the comparison of a green bone with a dry bone, side by side, will show there is a difference, yet an explanation is not out of place here. The green bone contains the natural juices (the water being a solvent), and upon evaporation the bone becomes very light. By weighing a fresh bone, and weighing it again when it is very dry, the difference will be found astonishingly great. The green bone contains meat, blood, gristle, oil, and mineral water in soluble condition. Upon exposure to the air, not only does decomposition occur, but the chemical changes are such as to rearrange the particles of the bone itself. All animal substances, upon decomposition, are finally converted into ammonia, which is volatile, while the evaporation of the water not only liberates all gaseous formations, but permits of chemical changes which convert much of the soluble material into that which is insoluble. The green bone, though tough, is soft compared with the dry hard bone. Insects also clear away from the bones all that is unaffected by exposure to the air, and, in place of the juicy, succulent green bone, rich in the phosphates, nitrogen, and carbon, we have the hard, dry, insoluble bone, brittle and bleached, and composed of but little more than phosphate of earthy matter, all of its real nutritious matter having passed away. The natural solvent cannot be regained or replaced.

The value of all foods depends upon their digestibility. The green bone, containing its natural juices, is digestible, especially by birds, and when in a very fine condition it is also digested by animals, because its particles are less dense; but the dry bone, having lost its solvent agent, has become harder, its particles rearranging closer together, and is only slowly digestible, if at all.

Bear in mind that it is not the amount of food eaten that gives the best results, but the amount digested. Nothing will make a chick grow as rapidly as will green bone—in fact, the growth seems marvellous. The object of this is to impress upon all who keep poultry the necessity and importance of utilising the waste materials. Eggs are always cash in the market, and especially in winter, while bones are more plentiful in winter than are some other valuable materials. The bone-cutters are labour-saving; they permit the use of valuable bone, and they pay back their cost in a short time, so that their use just now is almost a necessity.

The fresh bone serves a special purpose, for it contains the materials for the white of an egg, the yolk, and the shell all in a concentrated form, and in a partially soluble condition; while the dry bones will remain untouched—that is, as long as fresh bone is supplied. The cheapness of bones is another factor to be considered, as they can be purchased very cheaply from the butchers, and the improved bone-cutters will render them valuable and convert them into the most desirable of all foods in a very short time.—*Exchange*.

CHICKEN POX.

By W. HINDES, Poultry Expert, Queensland Agricultural College.

As chicken pox, commonly called "warts," will soon be troubling the chickens, especially those that have been late hatched, and as prevention is better than cure, I am sending a recipe which may be of use to readers of your *Journal*.

This disease is caused by a disordered condition of the blood; it is, therefore, not advisable to wait until the warts appear, but to see that the blood is kept in good order; the chickens will then readily throw off the warts when they come. They generally appear about this time of year, principally owing to the grass being burnt up by the hot sun, causing a scarcity of green food. The following will be found to be an excellent recipe for purifying the blood:—Take $\frac{1}{4}$ -lb. of liquid extract of sarsaparilla and $\frac{1}{4}$ -oz. of iodide of potassium, and mix with $\frac{1}{2}$ -gallon of water. Give each chicken half-a-teaspoonful once a day. If there are a number to be treated, a very good plan is to mix it with the pollard, thus giving less trouble. Should the warts break out, touch them with citric ointment, and allow them to dry down to a black scab; this will be ripe in three days, when, if lifted off, it will take with it the little roots of the disease. The affected birds should be removed from the others, as the disease is contagious.

TO BREAK UP BROODY HENS.

A METHOD NOT USUALLY PRACTISED BY FARMERS.

Ask an old farmer the best way to break up a broody hen, and ten to one he will tell you: "Shut them up and starve them, or duck them in cold water; throw them as far as you possibly can every time you come near the nest; tie a rag on their tails or build a frame where they must always stand on the roost, with no chance of settling down." A short time ago I heard a new way, and as I have tried it and found it worked well, I will give it to your readers.

Remove your hen from the nest carefully—and here is a point which it is well to follow at all times: Always handle a hen as you would a child, with care and consideration, as they are tender things, and jerking affects their nervous systems just as much as it would affect your child to grab it by the arms and legs, and swing it over your head once in a while. That is something which many people and even men and women who have made a study of the poultry business for many years do not know, or else they do not care to know. But, to return to my subject. Take the hen carefully from the nest, place her in a comfortable place, but in altogether new surroundings, where there are no nests, and do not starve her by any means. On the contrary, feed her on all

the rich concentrated foods she will eat, and especially see that she has some kind of animal food—green cut bone is about the best for this. Be sure she has plenty of grit, some green food, and water. Do not forget the last, as what we wish to do is to get this hen in laying condition again, and in order to do this she must have plenty of good food and water. Before long we find our sitting hen has renewed her entire constitution; that old broody feeling passes away, and she feels like getting out and enjoying the air, and will soon be laying again.

The reason this process acts so well and so quickly is that a hen after laying a large number of eggs becomes worn out; her constitution has stood a heavy drain for all winter, perhaps, and she feels a desire, a very natural desire, to sit, because it is the nature of a hen to sit and raise a brood of chicks at least once a year. By raising this brood she rests herself, and that is usually why she is in good condition when winter comes.—*Exchange*.

LIVER DISEASE IN FOWLS.

Diseases of the liver in poultry develop very fast, and when a hen once stops laying it is very seldom that more than one out of twenty ever lay again. Birds with liver disease may live a week, or may be months, and in some cases look quite red in the comb, but the meat on the breast gradually wastes away. On a cold morning, when the wind is blowing hard, is the time to detect such birds. One writer states that the bird will walk lame in the left leg, but we have generally found the trouble in the right leg, although several cases have come under our notice where one bird would be lame in the left, and the other (in the same pen) would have a similar trouble in the right; but there is generally a lameness in some part. A peculiarity in liver troubles is the excellent appetite the fowl usually has. They will stand at a trough and fairly gorge themselves, eating as much as two healthy fowls would, and yet so weak that they could hardly stand. Upon picking them up, one would be surprised at the light weight—nothing but skin and bones. In other cases they are without appetite, but suffer from an abnormal thirst, and drink continually. In congestion of the liver the plumage becomes rough. Instead of lying close to the body, they stand out or “stare,” as poultry-men generally call it. The birds stand huddled, droopy, and will seek corners of the house or yard to “lean up against.” There is more or less diarrhoea, at first more watery, then brown, and of a yellowish hue at the last. There is a purple hue to the comb, which gradually darkens until it becomes black. Congestion of the liver can be more successfully treated than any of the other forms. There are a number of good pills that can be used for this purpose, but we much prefer vegetable pills, for they will not gripe. Give a pill each night for three nights in succession. This follow with nourishing food, and two or three evening feeds of chopped onions each week. Ten drops of nitric acid per quart should be added to the drinking water. Inflammation of the liver follows a neglect to properly treat the trouble when it is merely a congestion. In this stage the fowl shows great thirst, with very poor appetite. The droppings are yellow, and generally frothy. The fowl is sleepy, shows the lameness already referred to, the breathing is laboured, and the bird rapidly loses flesh. About the best treatment that can be given in such cases is the knife. Enlargement of the liver is more common in keeping hens over their second moult. The fowls sit most of the time on the ground, and as the disease progresses will not go on the roost at night. Feed sparingly upon unstimulating food, and give plenty of green stuff. Atrophy, or wasting of the liver, is a result not so common. The liver becomes small and pale; the bird is depressed, drowsy; the plumage loses its lustre; the evacuations are of a bilious order, ending in a black or blood-stained condition. Before death the bird goes into a stupor, and dies in convulsions. Cure for this is very uncertain, and, as in inflammation of the liver, the fowl should be killed.

The Orchard.

PINEAPPLE CULTURE.

By ALBERT H. BENSON.

PART I.

THE SUITABILITY OF QUEENSLAND FOR PINEAPPLE CULTURE.

This well-known fruit is a native of tropical America, and has spread thence to practically all the parts of the world that are climatically adapted to its culture, as well as to colder countries, where it is grown under artificial conditions. It was introduced into Queensland some sixty years ago, the first plants being grown in Brisbane. From its introduction it soon spread to the Nundah, Albion, and Hamilton districts, where some of the plantations set out over forty years ago are still in existence; and not merely in existence, but in vigorous health, and producing fruit of good size and quality; in fact, little, if any, inferior to that of many of the younger plantations. From these original plantations the culture of pineapples has extended throughout the Brisbane district as far as North Pine to the north, Nudgee to the east, Mount Cotton to the south, and Oxley to the west, until at the present time the greater part of the land suitable for this culture in the Brisbane district is under pines. The Brisbane district still produces the greater part of our pines, but their cultivation has been considerably extended during recent years, so that this fruit is now to be met with in most of the eastern coastal districts, from the Tweed to Cooktown. Pineapples have found themselves admirably suited to our climatic conditions, when a suitable soil and situation has been selected for their culture, and when grown under such conditions have never been seriously injured by frost, drought, or floods. The climate of the Brisbane district is not one, however, that would be considered by many authorities the most suitable for the culture of this fruit, as the average annual temperature is under 70 degrees, and the average rainfall is only 58 inches. Many competent authorities in the older pineapple-producing districts of the world consider that the annual average temperature should range from 75 degrees to 80 degrees, with a rainfall of from 50 to 100 inches. This would give a climate somewhat similar to Cairns or Geraldton, instead of that of the Brisbane district, and experience has taught us that this does not altogether apply here, for though the pineapple grows most luxuriantly, and produces an abundance of fine fruit in the Cairns district, the quality is not equal to that of the Brisbane-grown article.

A rainfall of 100 inches is certainly not necessary, as our experience shows conclusively that our finest flavoured pines are always grown in comparatively dry years, and, further, that excessive rainfall is decidedly injurious to the plants unless grown on soils possessing perfect natural drainage.

The experience of other countries is thus not always applicable to our local conditions, but at the same time I think I shall be able in the course of this article to give some information relating to this industry as carried out elsewhere that will be of considerable value to our growers.

The profitable cultivation of pineapples without shelter is practically confined to 28 degrees of latitude north and south of the equator, for, though grown as far as 30 degrees north in Florida, U.S.A., their cultivation at this latitude is somewhat uncertain, and shed culture is rapidly superseding open planting.

This range of latitude places the whole of the eastern seaboard of Queensland within the accepted pineapple belt, and gives us a range of something like

1,100 miles from the Tweed to Cooktown. This is a very large extent of country embracing many different soils and different climates, from the extremely humid climate of Geraldton to the comparatively dry climate of Bowen, and to the climate of the Brisbane district with its even summer temperature, and, with the exception of the two past seasons, its regular summer rainfall. Owing to this wide range of soils and climate, we have many districts in Coastal Queensland particularly adapted to the growth of pineapples, and this is shown not only by the superior quality of our fruit, which is well known to all Australians and is always remarked upon by visitors from other pineapple-producing countries, but also by the vigour and productiveness of our plantations and the cost at which we can profitably produce the fruit. In fact, I doubt if there are many other parts of the world in which this fruit can be produced equal in quality to that grown here, or at a price that we can grow it at; and, further, I feel sure that were the industry properly organised and run in a thoroughly up-to-date manner both as regards the production and distribution of the fresh fruit, as well as the utilisation of any surplus by canning or otherwise preserving it, that we could hold our own in the world's markets with any other pineapple-producing country.

As far as Australia is concerned, the industry is practically confined to this State, and there is no probability of our encountering any serious opposition in the supplying of our home markets for many years to come, as though a few pines may no doubt be grown in the Northern Rivers district of New South Wales, particularly if shed culture is introduced, and possibly in the North-west Coast district of Western Australia, they cannot successfully compete against us. The industry belongs to us climatically; we can produce the fruit in abundance and of the finest quality, and we should, therefore, develop and work it for all that it is worth, as the pine is one of the few fruits that we can grow to perfection in our coastal districts.

Every advantage should be taken of our opportunities, and we should not rest content with merely supplying our local and southern markets with fresh fruit, but should build up a canning and preserving industry that will not only enable us to supply all Australian requirements, but will enable us to compete favourably in the open market.

BEST PINEAPPLE DISTRICT.

Although the Brisbane district, as already roughly outlined, still produces the greater part of the pines that are grown in this State, and has earned the reputation of producing the finest and best flavoured fruit, there are many other districts now coming to the front in which the cultivation of this fruit is being largely extended, and which will run the older pineapple districts hard, both in the quantity and quality of their output.

The North Coast Line district, from North Pine to Gympie, the Tiaro and Mount Bauple district, the Maryborough and Pialba district—all produce good pines, particularly the smooth-leaved variety. Although pines are not grown to any extent in the Bundaberg and Rockhampton districts, I believe that the sandy loamy country at Gooburrum, near Bundaberg, when free from frost, and the sandhills country near Rockhampton will produce excellent fruit. The Mackay and Bowen districts will also produce good pines when suitable soils—viz., free loams—and situations free from frost are chosen. The soil of the Lower Don district, at Bowen, is well suited to the growth of this fruit, though irrigation and manuring will be necessary to obtain the best results.

North of Bowen pines will grow anywhere that the soil is suitable, though when Cairns is reached the quality of the fruit, though of large size, is not equal to that of the more Southern grown fruit, the soil and climate being too forcing for the production of a firm good carrying fruit, and a fruit of the highest quality. The advantage of the Northern pines is their earliness, as they supply the market before the Southern pines are ripe.

SOILS SUITABLE FOR PINEAPPLES.

Pineapples are being grown on various kinds of soil in different parts of this State, from rich red or chocolate scrub soils, to poor, thin, sandy soils. In the Brisbane district the pineapple soils are generally of a loamy nature; in some places, as at Zillmere and Mount Cotton, it is a fairly heavy loam, whereas at Redland Bay, Cleveland, and parts of Nundah and Nudgee, the soil is a medium loam; and again in other parts it is of a sandy, loamy, or even freer nature. The freer the soil the healthier the pines, as a general rule. The soils on the North Coast line are either free sandy loams, of medium quality, or rich free scrub soils. At Maryborough and Pialba the pine soils are generally of volcanic origin, some scrub, some forest, and vary from light to somewhat heavy loams. At Bundaberg the soil chosen is of a freer nature, as is also the case at Rockhampton. In the North, free to medium loams, rich in humus and plant food, are usually chosen. It will thus be seen that no hard and fast line has been adhered to in the choice of soil, but that this fruit has been tested and usually found to do well in many classes of soil. At the same time, the following remarks respecting the selection of soil may be of value to beginners:—

When selecting a soil for pineapple culture the first and most important consideration is to make quite certain that it possesses perfect natural drainage. No stagnant water must on any account come into contact with the roots, and even during periods of excessive rainfall the soil must not become sodden and soured. Should such a condition of the soil occur, the finer root fibres are killed, and although the plant may not show any immediate signs of injury it is bound to do so sooner or later, and if the condition of the soil is not improved the plants will eventually die out. The perfect drainage, so essential to the successful production of this fruit, can only be obtained under natural conditions, where there is a porous subsoil, as if there is any hard pan or an excess of clayey or other impervious matter in the subsoil it will retain more or less stagnant water, especially during periods of prolonged wet weather. The character of the subsoil is therefore of the first importance, as no matter how suitable the soil proper may be, if the subsoil is unsuitable the plantation is bound to suffer.

There is also one other very important consideration to be noted in favour of naturally well-drained soils, and that is that they are warm soils, and plants growing on them are much less liable to injury during any cold spells than in the case where the subsoil is unsuitable, and the soil thus naturally colder.

Land possessing a friable soil, and a friable and naturally well-drained subsoil, will stand drought well, as capillary attraction is good under such conditions; and if the surface is kept well worked, the soil will be supplied with sufficient moisture for the plants' requirements.

Sandy soils, sandy loams, free loams, gravelly soils, and even soils pretty well covered by stones, all grow good pines, but for choice I prefer the deep free sandy loams for the following reasons:—

- 1st The ease with which they can be worked;
- 2nd Their power to retain moisture during a dry spell when properly cultivated;
- 3rd Their perfect drainage and consequent warmth;
- 4th The readiness with which they respond to judicious manuring;
- 5th Their power of producing or rather encouraging the development of a perfect root-system, which is not merely confined to the surface of the ground, but in the case of smooth-leaved pines extends to a considerable depth; hence the plants are better able to stand a dry spell than when grown in less suitable soil.

Many soils otherwise suitable for the production of pineapples are rendered unsuitable through possessing unsuitable subsoils; but in most instances, if the stagnant water is removed from such subsoils by means of a thorough system

of subdrainage, pines will thrive well and produce good fruit. Subdrainage, by removing the stagnant water, warms and sweetens the subsoil, and thus renders it suitable for the growth of pines.

Whilst dealing with the question of soil, it is interesting to compare the land now under pineapple culture in this State with that of other pineapple-producing countries, as it will tend to emphasise my remarks respecting the extreme importance of selecting land possessing perfect natural drainage, and will give our growers an idea of what others are doing. The first country I will deal with is that of Florida, U.S.A., where the culture of pineapples is now being carried out in a more scientific and up-to-date manner than in any other part of the world. The following remarks are taken from a bulletin on pineapple-growing written by Mr. P. H. Rolf, and published by the United States Department of Agriculture in 1901:—

"The proper selection of soil for pineapples is the most important problem in connection with their culture. The requirements of this plant in this respect are so different from the ordinary fruits that it took many experiments to convince the would-be pineapple-grower that he has here a plant that demands a soil intolerable to the ordinary crop of vegetables. This crop can be grown upon land that will produce ordinary vegetables, but the soil must be of loose and open nature, and not allowed to become water-soaked. It is not the fertility nor the humus in the soil that is detrimental to the pineapple, but it is the want of free drainage."

Speaking of the analyses of typical Florida soils, Mr. Rolfe states: "They are exceedingly interesting, especially so from the fact that they show the soils deficient in every constituent that is thought to be a necessary element of plant food."

This is clearly shown in the tables of chemical and mechanical analyses attached to the report, from which it is seen that the total insoluble residue in the fine earth varies from 92 to 98 per cent. in the soil, and from 83 to 99.4 per cent. in the subsoil; and, in the case of the mechanical analyses, that coarse, medium, fine, and very fine sand make up a total of from 97 to 98½ per cent. in the soil, and from 97 to 99 per cent. in the subsoil. Though I have not had an opportunity of seeing the Florida soils, I should say, judging from their analyses, that they are very similar to the sandy soils of Stradbroke and Fraser's Islands—soils that are usually considered to be worthless, but have yet been proved in Florida to be well adapted to the culture of pineapples and other crops.

To give an idea of the poverty of the average Florida soil, I may state that when it is compared with Professor Hilgard's average of all soils it is found to contain only about one-eleventh of the potash, one-third of the phosphoric acid, but nearly fifteen times as much lime. Some of the soils, however, only contain one-half as much lime as in Hilgard's average, and, strange to say, these are considered some of the best.

I have gone into this matter of the Florida soils pretty fully, as it will tend to show that we have a large area of similar or slightly better soils available in this State, on which the culture of pineapples can be successfully carried out, provided we follow the lines laid down by Florida experience. I have seen good pines grown here in the poorest of sand; only in isolated cases, but still enough to show that such soils are well adapted to the plants' requirements, provided they received the necessary manuring essential to the production of a crop.

Pines are grown on a totally different kind of soil on the Keys, situated on the south-east coast of Florida. Here the soil is a partly decomposed coral with a little humus between the lumps. Such a soil has perfect drainage, but soon gives out. Cultivation cannot be carried out, and as far as I can find out manuring has not been attempted, as from the nature of the soil the first rain would be apt to wash all manure away. The scrubby growth is burnt off, the plants put in wherever there is a chance to stick them, and when the ground is exhausted the plantation is abandoned.

Speaking of pineapple soil in America, Mr. Robert Thompson, formerly superintendent of the Jamaica Botanic Gardens, who has recently visited Florida, and has written a report on the cultivation of pineapples and other products of Florida, issued in 1901 by the Jamaica Board of Agriculture, states: "The condition of the soil in Jamaica is the perplexing element. Intermediate between the barren sand and the ordinary soil of Jamaica, we have to strike the best possible medium. In other words, to ensure success for this culture, the soil selected must be peculiarly sandy, gravelly, or rocky even to the extent of impoverishment in the natural supply of plant food, which deficiency can be advantageously added according to the requirements of the soil."

When speaking of the Porto Rico and Hawaiian soils, Mr. Rolfe states that the soils on which pines are grown are naturally fertile, and can produce fruit for a number of years without manuring. In the Philippine Islands the soil on which pineapples do well is disintegrated lava covered with a layer of humus; a very porous soil that is said to be improved by the addition of a small quantity of clayey matter to increase its capacity for retaining moisture; but the presence of clay in excess is undesirable.

Mr. H. N. Ridley, Director of the Botanic Gardens, Singapore, in reply to a question as to the most suitable soil for pineapple culture, states: "The soil used is dry and clayey, with much iron usually; in fact, the worst soil we have for the cultivation of other plants. Too rich soil does not suit the pine."

It will thus be seen by the foregoing extracts, which have been taken from reports sent to this Department in reply to letters seeking information on the important question of pineapple culture, that perfect drainage is considered to be essential to their successful culture, and, further, that land that is considered too poor for the culture of ordinary farm crops is often chosen for the culture of pines.

SELECTION OF SITE.

In addition to the question of obtaining a suitable soil for pineapple culture, there is one other very important matter to be taken into consideration, and that is the choice of a site. In the first place, the land must be as free from frost as possible, as even light frosts do a very large amount of damage, both to the fruit and plants. In the second place, a good protection from westerly winds is of great value, as the cold dry westerly winds of winter often do an equal amount of damage to the plants to that caused by a light frost; and, thirdly, the plantation should be within easy reach of rail or water carriage, as the crop is a bulky one to handle, and the less knocking about it receives in transit the better.

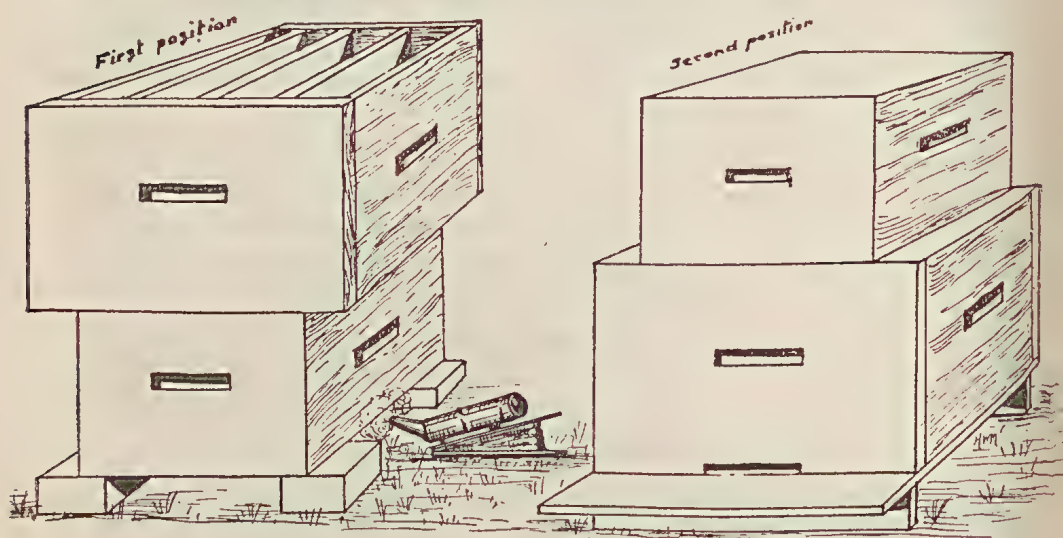
In districts where frosts are at all prevalent high-lying land must be chosen, as such is much less liable to be injured by frost than adjacent low-lying land; and not only that, if suitable soil has been chosen, as already described, such a soil on high land is always warm and not easily affected by a cold spell. High land has, however, its disadvantages, as it is seldom that it is level, but usually has more or less of a slope. Sloping ground, though well suited to pines, is much more expensive to work than level land, as it is always liable to wash more or less during heavy rains, especially when the method of planting ordinarily carried out in this State is in vogue. Where there is no danger of frost, the land cannot well be too level, provided the drainage is perfect, as level land does not wash, is easier to work, and retains moisture better, as a rule, than sloping land. The question of shelter from westerly winds, as already mentioned, is of considerable importance, and this shelter should consist of either higher land to the west or of a belt of scrub or forest, which should be left standing for this purpose. Where there is no natural shelter, a belt of mango or orange trees will often be found to be considerable assistance, and the returns from these trees, when they are properly attended to, will pay handsomely for the care and money expended on them.

Apiculture.

A SIMPLE METHOD OF TRANSFERRING.

By H. R. STEPHENS, Toowoomba.

To transfer bees from box to frame hives, a simple way is to prize off the cover and bottom board of the box hive, and then support it on four bricks, which would raise the box hive from the ground. The frame hive is then put on top of the box hive, and the bees smoked and drummed up above. If the frames are then lifted out, the queen will probably be found on one of them,



when the frame hive is put below and the box hive on top, with the excluder between. In three weeks the eggs will all have hatched, with the exception of drones, when the honey and wax may be taken from the box hive, which can then be removed, the usual frame super being given instead. I have used the above method with two colonies about three weeks ago, and had little difficulty in securing the queens.

SALE OF HONEY IN THE AMERICAN MARKET.

The *Agricultural News*, Barbados, writes: Mr. Geo. S. Hudson, agricultural instructor at St. Lucia, forwards the following information which should be useful to West Indian honey shippers:—

Messrs. Gillespie Bros. and Co., New York, of whom Mr. Hudson had made inquiries with reference to honey, wrote on 30th September:—

“At the moment there is a very good demand for extracted honey; we think it will be worth while sending forward some for sale in this market. We do not know exactly what St. Lucia honey would fetch, but for Jamaica honey we can get, and have sold at, 41c. to 43c. per gallon duty paid. These prices you will find to work out more advantageously than the current London and European quotations. Jamaica ships to this market principally in barrels or casks containing about 30 American gallons—that is, about 26 Imperial gallons. For honey in cases, two tins each, perhaps a trifle more money would be paid. Oil tins must be rigidly excluded, and only new containers used. We

send you a *pro formâ* account sale for your guidance. Recently some honey in comb was received from Cuba. It carried very well in packages of 24 and 48 sections of 1 lb. each. Our broker reports its sale at 55 cents per lb. delivered, and thinks with such good values ruling you might try our market with a shipment in this form, giving special care to the packing to ensure safe transit.

"Mr. Hudson, commenting on the above, says:—I fail to see that it is advantageous to ship to New York in place of London. Forty-two cents per gallon is only equivalent to about 16s. per cwt., which price is obtainable in London for medium quality honey. The net proceeds of Messrs. Gillespie's *pro formâ* account sale work out at 35 cents per gallon, or about 13s. 3d. per cwt., including freight, duty, commission, &c. I cannot help thinking that there must have been something quite exceptional about the Cuban consignment of comb honey that sold at 55 cents per lb., as on the same date, according to the market reports published in *Gleanings*, the maximum price realised for fancy white comb in all the principal markets of the United States was 16 cents per lb. Still, I am of opinion that it is decidedly worth while making some experimental shipments of comb honey to New York."

As our Queensland honey is often so low-priced as to make it scarcely worth while to extend the industry of apiculture, it might be advantageous if honey producers were to combine and send a trial shipment to New York. Comb honey at 55 cents (11d.) per lb. should leave a good margin of profit to the shipper.

UNFERMENTED WINE.

Professor H. E. Van Simon gives the following directions for preparing unfermented grape juice for home use, and which has been published in the American papers:—"Put the fresh clusters, after all bad berries are taken off, into a cider press with a coarse cloth next the cage, and press out a part of the juice very lightly. As soon as it begins to get dark red the pressure should stop, and all the juice so expressed be kept by itself and put on to heat. Test it by a thermometer, and when it reaches 175 degrees bottle it at once, without any sugar or other thing in it. If it is brought to the boiling point, it will lose the delicate grape flavour and have a cooked taste. The bottles should be kept hot in boiling water and the corks, too, so there will be no lurking germs of ferment left. Their tops should be dipped in melted wax to make them still more secure from the air. The darker juice may be pressed out as long as any of consequence remains in the pulp, but this should be heated and bottled by itself. It will not have the mild flavour of that first extracted, but some may like it better, and I have found this to be the case occasionally. Grape juice made in this way needs no sugar or anything else at any time, nor any dilution when the bottles are opened. It is mild and entirely harmless. There is no beverage that is better for the sick or well. Every grape-grower can have it at little cost. It is the essence of the grapes, without the bothersome and useless seeds and skins."

Tropical Industries.

TOBACCO NOTES.

By R. S. NEVILL.

The American Tobacco Company have been knocked out in their fight with the Imperial Tobacco Company of the United Kingdom, and have now invaded Germany.

The French tobacco monopoly yielded to the Government in 1901 £16,666,000, and is estimated to yield an additional £550,000 in 1902.

It is a curious thing that the first loan made by the United States Government was made payable in tobacco.

GROWING WRAPPERS ON FILLER SOIL.

At the recent annual convention of the Association of Official Agricultural Chemists, Secretary Wilson, of the United States Agricultural Department, offered a salary of \$10,000 per year to any man who would discover Nature's secret of producing burley on certain soils and dark tobaccos on others.

The discoveries of the Agricultural Department of methods of tobacco culture and curing have so revolutionised the tobacco-growing industry that at present tobaccos equal to the best Havana may be grown in the temperate zone under proper conditions. The region in which the different tobaccos are grown are so distinctly marked that it is hoped that an analysis of the different soils, as to texture and composition, may disclose the reason for a burley belt and a dark belt.

Present experience has shown that the yield, size of leaf, and the grain may be modified by fertilisation, but until the present no success has been attained in growing wrapper leaf on filler soil, or *vice versa*.

STOCKS OF AMERICAN TOBACCO.

Reports from British markets state that the total stocks on hand of Virginia leaf approximate a two years' supply; Virginia strips, $1\frac{7}{8}$ years; Western Leaf, $\frac{1}{2}$ year; Maryland, $1\frac{1}{2}$ years; with a total average of all tobaccos of $2\frac{1}{2}$ years' supply on hand.

SOUTH AFRICAN TOBACCO.

The annual crop of tobacco grown in South Africa is estimated to be between 5,000,000 and 10,000,000 lb., with an average price realised before the late war of 25 cents, and double that price since the war. England is making great efforts to encourage the culture of tobacco in her new colonies.

CASSAVA.

In our January issue we published an article on "Cassava as a Feedstuff," written by Mr. J. C. Brünnich, chemist to the Queensland Sugar Bureau, by direction of the director, Dr. Maxwell.

The article commences with the statement that "Cassava is supposed to exist in at least two varieties, which are commonly known as Sweet Cassava (*Manihot aipi*) and Bitter Cassava (*Manihot utilissima*); but it does not appear quite conclusive, however, that more than one variety actually exists, and

it is also indicated that the difference of sweetness and bitterness . . . may be only due to the conditions of soil and climate in which the cassava plants are grown."

This opinion of Dr. Maxwell is most conclusively borne out by the recorded experience of cassava planters in Jamaica, who, in response to very particular inquiry regarding experiences with cassava in that island, have reported as follows:—

"Soil has a great effect on cassava, as I have seen sweet cassava turn quite bitter on some lands; the variety called 'Mexico' (which is very productive) being especially apt to change in this way. The change is generally produced by planting on a free level soil, after growing on stony hilly land; the negro explanation being, that 'Cassava no like fe grow too easy.'"

"Sweet cassava must be peeled to be safe. There are some kinds that pigs can eat safely as they are; and others that have poison apparently in the skin only. In cooking, the cassava is peeled first. To me, some varieties called 'sweet,' seem to have some of the properties of the bitter. Certainly, if fed as dug, they poison pigs. I have fed sweet cassava peeled to pigs and poultry, but I prefer it boiled for the latter. I fling down whole pieces rather than cut up small for large stock; sometimes cows choke on large cut pieces."

"Our bitter cassava, if planted Central America, turns to sweet."

SISAL HEMP.

We have several times drawn attention to the value of sisal hemp as an adjunct to farm crops in this State. There is not any district on the Queensland coast where the sisal hemp plant (*Agave rigida*) will not grow to perfection, and not only does it thrive on rich soils, but equally good results are obtainable on the poorest rocky, shaley ridges, whether in a wet or dry season. It defies drought, and does not like a wet subsoil. At St. Helena Penal Establishment it grows to perfection on the rich, red, volcanic soil. At Childers, in the Isis Scrub, it has proved equally suitable as a crop. We have been asked where a market can be found for the clean hemp. There is a good market in Melbourne for all that can be manufactured here. Last year the Department of Agriculture had a sample of St. Helena cleaned by hand. This was sent to Messrs. James Miller and Co., rope and twine manufacturers, in Melbourne. A reply has just been received (December 12, 1902) from that firm to the effect that "the sample is of very superior quality, and is worth about £35 per ton. The value is regulated by the price of Manila hemp, which of late has been very high and is now falling. There is very little sisal imported into Australia. In the United States it is extensively used. There would be a market here [Melbourne] and in Sydney for a large quantity of it."

Very few farms are without a few acres unsuitable for the cultivation of ordinary farm crops. These plots could be profitably utilised by planting them with sisal hemp. Let us see how it would pay a farmer to plant up these vacant plots. Each acre will carry 600 plants. Each plant will furnish from twenty-five to 100 leaves annually. This means a yield of from 15,000 to 60,000 leaves per annum. One hundred leaves produce 4 lb. of fibre, so that an acre will produce from 600 lb. to 1 ton of fibre. It is not at all uncommon to obtain a yield of from 1½ to 2 tons of fibre per acre. Sisal hemp is usually worth £40 per ton. Put it at £35, as stated above. Deduct as much as 50 per cent. for working expenses, and still there remains a profit to the grower of from £17 10s. to £26 5s. per acre. In America, farmers, by planting out the sisal aloe in out-of-the-way places, derive as much as from £100 to £400 per annum from their sales of fibre. Why cannot Queensland farmers start the industry? In the following volumes of the *Journal* we have given full particulars as to the industry:—Vol. I., pp. 382, 462; Vol. V., p. 420; Vol. VII., p. 60; Vol. VIII., p. 129; Vol. IX., pp. 488, 567.

The Department of Agriculture will supply plants to all who wish to enter upon sisal hemp growing, and will give reliable information on the cultivation of the plant, the preparation of the fibre, and the machinery needed for the work.

We would advise intending growers to confer with the Agricultural Adviser, Mr. P. McLean, who is thoroughly conversant with the industry, and whose article on the subject in Vol. I. of the *Journal*, p. 382, covers the whole ground.

DIEBACK IN COCOA.

It is a very general belief that the alluvial soils along river banks form the very finest areas for the cultivation of cocoa. This is as a rule true, but there may be certain exceptions not generally taken into account, and the rule that wherever bananas grow very easily the same soil is good for cocoa is not an absolute rule at all. They require the same conditions of climate and soil, but cocoa requires more; it should have a deep soil. The banana is a surface-feeder, and an alluvium 3 feet deep, provided there is gravel and free drainage below, will suit excellently, whereas clay below does not suit it so well, necessitating elaborate drainage, while on the contrary cocoa does not so much mind a clay below so long as it is not sour, but objects more to a gravel. There are some subsoils to loamy alluvium that are clays; the cocoa thrives there well. Other subsoils are sand; the cocoa does not object. Others are gravels, but with plenty of earth—that is, a gravelly earth—the cocoa stand this. But when there is a bed of pure gravel below, the taproot of the cocoa finds it objectionable, stops growing, and dies back, when the top of the trees respond by dying back too. On inspecting a place whereon to grow cocoa, the subsoil should be a subject of close examination. Another cause of dieback, besides the existence of a coarse gravel below, is the too close proximity of vigorous growing bananas. Deep shade is beneficial to young cocoa, but when the plants are well established, which is at a year old, it does not do to have them surrounded by dense walls of bananas, with the soil crowded with their vigorous greedy roots. The young cocoa, with its taproot striking downward, has not many superficial feeders like coffee or oranges; it cannot make a good fight for itself, and is often starved. In old banana plantations where there is a large growth and cocoa is to be planted, it is a good plan to plant the cocoa in the line of the bananas, and replant the bananas between the old rows when the cocoa is two years old. At any rate, the cocoa must have light and air, but not direct sunshine above, and plenty of room without severe competition to feed on the soil below. When cocoa-trees begin to die back, it often enables them to overcome their weakness by cutting back slightly and fertilising. This encourages the making of more lateral roots, which thus give larger feeding powers.—*Journal of the Jamaica Agricultural Society.*

THE DEMAND FOR COTTON.

To the Year-book of the United States Department of Agriculture for 1901, Mr. J. L. Watkins, the Cotton Expert of the Department, contributes a paper, entitled "The Future Demand for American Cotton." This paper is of particular interest to the West Indies at the present time, containing, as it does, an account of the extraordinarily rapid growth of the world's demand for cotton during the last hundred years, together with some forecasts as to the future.

The three most important textile fibres of the world are flax, wool, and cotton. At the end of the eighteenth century (1793) wool occupied the first place in Great Britain, flax being second, and cotton third. "In fact, the

value of cotton fabrics and yarns amounted to only 5 per cent. of the whole." Ten years later cotton had advanced to second place, and in another ten years had attained the lead. This position it still occupies, with its two competitors left far behind. The following figures from Elison's *Cotton Trade of Great Britain* well illustrate this point. The consumption of cotton, wool, and flax in Great Britain is given in millions of pounds:—

Years.		Cotton.		Wool.		Flax.
1799-1801	...	41.8	...	100.6	...	108.6
1898-1900	...	1,594.0	...	496.6	...	214.7

These figures show that during the last century, whilst the increase of consumption of flax increased about twice, that of wool increased by five times, and that of cotton by no less than thirty-nine times.

The enormous increase in the amount of cotton used has been due to various causes. In the first place, new markets have been found for cotton goods, and many races who formerly went unclothed now wear cotton fabrics. In other countries cotton has entered into competition with linen, wool, and silk. An interesting example of the competition between cotton and linen is given in the "Decline and Fall of the Linen Shirt," a recent editorial in the *Irish Textile Journal*. "According to this authority the Rothschilds used to order, on occasions, a supply at a price up to £1 10s. a shirt, whereas those now required for the Duke of York and other royalties are turned out at Belfast with only fronts and cuffs of linen, the bodies of cotton." Similarly cotton has become a formidable competitor of wool, and even of silk, and "mercerised cottons" now displace silk to a certain extent in various classes of goods.

The world's total consumption of cotton has increased threefold during the last fifty years. In 1860 about 4,500,000 of bales of cotton (of 500 lb. each) entered the markets, whilst in 1901 the "commercial crop" was 12,500,000 bales. Of this total no less than 85 per cent. is supplied by the United States.

With regard to the future demand for cotton, Mr. Watkins states: "It is estimated that of the world's population of 1,500,000,000 about 500,000,000 regularly wear clothes, about 750,000,000 are partially clothed, and 250,000,000 habitually go almost naked, and that to clothe the entire population of the world would require 42,000,000 bales of 500 lb. each. It therefore seems more than likely that the cotton industry will go on expanding until the whole of the inhabitants of the world are clothed with the products of its looms. This is not an unreasonable conclusion when we consider the fact that cotton is the cheapest material for clothing known to man. In the meantime it may come to pass that the world's area suitable for cotton culture may have to be seriously reckoned with."

It is improbable, therefore, that the supply of cotton in the world is likely soon to exceed the demand, and, although the West Indies can never hope to regain their old position and contribute 71 per cent. of the cotton used in Great Britain, as they did in 1793, there seems no reason why they should not once again produce cotton to a sufficient extent to be a very considerable source of wealth to these colonies.—*Agricultural News*, Barbados.

COTTON-GROWERS' COMBINE.

The *Florida Agriculturist* gives the following illustration of the value of co-operation amongst farmers, a business our farmers have not yet been educated to:—

It might be well to again call attention to an incident which occurred last season at Alachua, Florida, which not only convinced the farmers of that section of the good effects of co-operative action and holding their cotton for good prices, but it culminated in forming in February, 1902, a State association of the long-staple producers. Briefly, their experience was this: Last October

(1902) a number of farmers in Alachua county had accumulated 2,000 bales of long-staple cotton, for which they had been offered 15 cents ($7\frac{1}{2}$ d.) per lb. by the buyers. They decided that such price was too low, after investigating the probable yield of the crop and the high prices at which the manufactured fabrics were being offered for sale. It was decided to go into a local organisation, to place their cotton, and appoint a committee from their number to fix a minimum price on their holdings and stand steadfast together.

The committee met, and promptly fixed the prices at 21 cents ($10\frac{1}{2}$ d.) an advance of 6 cents per lb.

The long-staple buyers ridiculed the proposition, and predicted that the entire 2,000 bales would be offered at a much lower figure before the season was over. The clubs, however, stood by the committee, and correspondence was opened with long-staple buyers in all the local markets. In less than three months a buyer from Blackshear, Ga., went down to Alachua and bought the entire lot of 2,000 bales at 21 cents ($10\frac{1}{2}$ d.) per lb., putting into the pockets of the members of that club 60,000 dollars (£12,000) more than they would have received had each man sold his cotton separately at the figures offered by the buyers before the club was organised.

The result of that small co-operative effort and the success of the undertaking has terminated in the organisation of a State association of cotton-growers, a strong club in Alachua county, where a splendid warehouse has been built by the farmers; strong clubs in other counties, with a new warehouse at High Springs, and other co-operative buildings of a similar character and purpose in other sections either in contemplation of construction or already being built. The sentiment is daily growing in the minds of the farmers all over the country.

MORE ABOUT GINSENG CULTURE.

So much curiosity has been aroused on the subject of the high-priced ginseng root that the Department of Agriculture has imported a small quantity of seed from Japan, which will be sown at the Kamerunga State Nursery and at the State Farm at Westbrook. It will be a long time, however, should the seed germinate and make strong plants, before the commercial value of the roots can be known, as they require from five to seven years before they can be considered ready for market.

A correspondent of the *Florida Agriculturist* writes as follows on ginseng culture:—Ginseng seed that ripens this fall will not germinate before the spring of 1904, or eighteen months after maturity, and if the seed once becomes dry it will not grow at all, hence it must be kept just right, just damp enough to save the germ. My method of caring for it is by placing it in flower-pots with fine soil sifted among the seeds and put away in a dark place for the allotted time, and at the expiration of that time plant the seed in soil well mixed with leaf mould. The plants must be grown under shade in Florida, absolute shade. A pineapple shed is a good place, with the open places filled in with slats the same width as the opening to exclude the sun is imperative, especially in Florida. While it has been considered that ginseng could not be grown in Florida, yet conditions can be made so that it will grow here as well as in Tennessee or Kentucky.

About twelve years ago it was said ginseng could not be grown under cultivation, yet to-day there are many hundreds of gardens from Massachusetts to Missouri, where it is grown successfully.

The most important part of the problem is, Can it be sold after it is grown? The northern growers all say, "Yes, in unlimited quantities." Where? Answer, in China. Our American physicians and chemists argue that there are no medicinal values in the roots, yet our Chinese friends tell us that it is the cure for all ills, as well as a charm to keep off evil spirits, both real and assumed or imaginary. A gentleman called on me last spring to see some of my plants, and while here stated that he had seen the dried roots sold in China for their

weight in gold, the dried roots placed in one side of the scales and the gold to balance in the other side. The seller took the gold, and the purchaser of the roots took the ginseng.

If my advice is worth anything, I would say, let the new would-be planter go slow. Get a few roots, grow them well, and see if there is a market for them; if this is satisfactorily solved, then go ahead. Remember, it takes one-year-old roots from five to seven years to be of age to be placed on the market.

GETTING RICH ON GINSENG.

A meeting of the ginseng-growers of New York State was held in Tully, New York, lately.

To the average person this news item is puzzling, yet, on closer inquiry, there is brought to light a story of how large sums are being made from the culture of a wild root which has been used by the Chinese for centuries, and for choice specimens of which they often pay a price equivalent to its weight in gold. The Government reports show that this important article of commerce has grown scarcer year by year, and is now, in its wild state, nearly exhausted.

One could hardly expect the people who gather the roots in the woods—the “sang diggers”—to take advantage of the money-making opportunities which the cultivation of the plant would afford, for they are a shiftless, roving people, wholly incapable of keeping up with the march of modern progress. In the early history of the trade, efforts were made to cultivate the plant, but without exception these attempts failed.

Some fifteen years ago a few young men, who were laughed at for wasting their time, again tried its cultivation, and by careful study of its requirements succeeded in establishing the fact that it could be made a certain and exceedingly profitable crop. The price of the root has advanced steadily for thirty years, and this has caused the native diggers to harvest even the young plants before they could bear seeds, and have thereby taken away all hope of increase or even the possibility of replenishment. Practically, the only seed and roots to be had now are from the gardens of the pioneer growers.

The land needed for its culture is so small that even a couple of square rods of garden space can be made to pay hundreds of dollars annually. A half-acre of ginseng will yield a larger profit than many 200-acre farms.

The ginseng gardener has the advantage of the ordinary farmer in many ways; there is no heavy interest on the money invested in land, no large barns needed to store the crop, no outlay for horses, stock, tools, or hired help, and a woman can as easily do the work required for half-an-acre as can a man. One gardener in Cortland county, N.Y., has been banking 5,000 dollars a year regularly for the past four years, and that alone from the sale of seeds raised on less than one-third of an acre.

There are in this county alone about seventy-five gardens under cultivation, and it is not exaggerating to say that most of the owners are to-day worth thousands of dollars, many of whom, five years ago, were not worth 200 dollars. United States Consul Johnson is quoted as saying that 20,000,000 dollars worth of ginseng could be marketed each year in China, if America could supply that amount of roots.

In 1858 there were exported 336,000 lb., while in 1900 there were exported less than 130,000, the price in that time having advanced steadily from 52 cents per lb. in 1858 to an average of 6 dollars per lb. in 1900, while to-day the price varies from 7 to 10 dollars per lb., according to the grade.

If the average housewife realised that from a ground space in her own dooryard, or 12 feet wide by 20 feet long, she could realise 150 or 200 dollars each year, with no more attention than is required for a flower bed, it is reasonable to suppose that ginseng would become one of the most widely cultivated crops in America. It seems like a tale from Arabian Nights to say

that an investment of 25 dollars will increase yearly in value until at the end of eight years it will have a total value of over 10,000 dollars; yet statistics prove that even these figures have been exceeded by the growers who have gardens under cultivation to-day.

Those who have studied the conditions governing the use of the plant in China are of the opinion that enough ginseng cannot be produced in the next fifty years to cause the price to fall. As a matter of fact, the known sources from which ginseng can be gathered for export are so limited that the price of the root must needs advance steadily for the next fifteen years.

The roots often form in grotesque shapes, and it is not infrequent that the root takes the general shape of a man's body—head, arms, and legs complete. For such a root of good size the Chinese will pay fabulous prices.

When any member of a Chinese family is seriously sick, the priests are called in (as many priests as there is money to pay for), who dispose themselves in a semicircle about a high altar, erected for the occasion, on which is an image of Buddha, flanked on each side by a tall candlestick. At the feet of the image is a carved tray, on which is placed the wondrous ginseng, which is to bring the sick one back to health.

During the prayer the priests sit Turkish fashion, with their feet tucked under them. Their prayers invoke the blessing of the idol on the magic root, which is afterwards ground fine and steeped into a tea, which is then given to the patient.

The prayers are always intoned, and in some cases are so well rendered as to remind Americans of the cathedral services held in Christian lands. Nearly always the prayers are rendered to the accompaniment of weird music from horns and shells and the shrill notes of an instrument made from a human thighbone hollowed out and converted into a musical pipe.

This prayer lasts for about twenty minutes, when the high priest, attired in a gorgeous dark purple robe, passes among the participants and presents each with a cup of strong tea, on the surface of which is floated a small piece of butter. Having drunk the tea, they resume their prayers in good earnest for another twenty minutes.

They then consider the job completed, and if anything on earth is going to save the sick one that root of ginseng they think will be the article to do the trick. At the time of childbirth the mother will always have a root of ginseng on the small altar in the room; if the child lives, it is given the root to guard carefully all its life, as having been its chief sponsor when it made its first kow-tow to an admiring family.

In gambling, which is always a strong passion with every Chinaman, the ginseng is often concealed in the folds of the clothing, and if bad luck attends the player the root is brought out and appealed to to change his fortunes. Chinese merchants keep their choicest roots wrapped in fine silk and put them in a small metal box, which is again placed in a larger wooden box—the inner one securely packed around with quicklime to absorb all moisture.

When purchasing a small root, one is requested not to breathe upon or handle it for fear of the root absorbing even a small amount of moisture. The merchant may be depended upon to dilate on its many virtues and the wonderful cures it has effected.

The ginseng is often sent to friends as a valuable present. In such cases it is usually accompanied by a small, beautifully finished double kettle, the inner kettle of silver and the outer one of copper. This kettle is used only for making the wonderful ginseng tea.

American chemists have found no medicinal properties whatever in the plant, and its curative value is imaginary. However, that is of no consequence to the American grower, for it seems that John Chinaman must have pinned his faith to the root when Adam was a little boy, and has held to it ever since.

A thousand years from now will find him still holding to his belief in its virtue, and will also find the American grower still active in exchanging the root for its equivalent in American dollars.—*New York Times*.

THE JOHNSTONE RIVER DISTRICT—ITS CAPABILITIES AND PROSPECTS.

By J. F. HARDING.

No. 1.

The object of this paper is to supply reliable information to intending selectors as to the land, rainfall, climate, means of access, and crops, also other items of interest to persons on the lookout for a place in which to build a home.

THE DISTRICT.

The watershed of the Johnstone River, and the adjacent country which is drained on the south by Maria Creek, Liverpool Creek, the Moresby River, and their tributaries, comprise the district on which it will be my endeavour to enlighten intending selectors.

Bounded on the east by the Pacific Ocean for 50 miles, on the south by the Tam o' Shanter Range, on the west by the Herberton tableland, and on the north by the Cairns district; roughly an area 50 miles long by 30 miles wide. I will start at the southern end of the district, and, taking the streams in order as met with, will describe each as far as I can, travelling up stream from mouth to source. In some instances the reader will find the description meagre—the reason, unexplored country. Where my own knowledge fails I employ information received from trustworthy sources, and my aim will be to keep strictly to facts.

MARIA CREEK

Is a fresh-water stream navigable for flat-bottom punts for 3 miles. I am told that on the lower reaches rich alluvial land exists, suitable for the growth of bananas, sugar-cane, &c., though in the wet season it is believed to be flooded. There is good timber—oak, beech, bean-tree, &c.—growing on its banks. Most of the watershed is covered with a dense growth of lawyers, climbing bamboo, wild banana, &c., so thick and tangled that a scrub knife is a necessity. On the upper reaches there are some fair-sized grass patches up to 1,000 acres in extent, level and fairly good soil, abundantly watered, with creeks running into the Maria. The ranges at the head are jungle-covered to the summit—none of the hungry forest range formation so common in the south to be seen. There is little or no alienated land on this creek.

LIVERPOOL CREEK.

Six miles to the north Liverpool Creek runs into the sea. Pugh's Almanac sailing directions state that Liverpool Creek "has a bar entrance which shifts after heavy weather or floods. The bar is dry at low water, 5 feet low water inside." On both banks for miles stretch low-lying alluvial lands, some swampy—perhaps suitable for rice-growing. Some who ought to know say for this purpose it would be hard to beat. Then, large areas covered with bananas (wild variety), denoting rich damp soil, and the ever-present jungle of lawyers, bamboo, &c. Nine miles from mouth it is a sandy bed 50 yards wide, with a body of fresh water as clear as crystal, 3 feet deep, and about 40 feet wide. Here the country on both sides consists of a belt of rich alluvial scrub, varying from 10 chains to $\frac{1}{2}$ -mile wide; then open apple-tree flats full of running creeks—typical dairying country. There is also some poor sandy and swampy stretches. The upper reaches of the river disappear in the scrub-covered ranges and spurs that abut on the coast range. The country on the drainage basin is nearly all Crown land. So far there is no rise and fall in the level of the country, and thus, when settlement comes, a light 2-feet gauge railway would connect all the country so far mentioned with the port of the district, Mourilyan Harbour, of which more anon.

THE MORESBY RIVER

Is navigable for 11 miles. Pugh's Almanac sailing directions say, "Empties itself into the southern end of Mourilyan Harbour, and a narrow channel with 4 feet at low water leads from Camp Point to the mouth of the estuary; for the first mile after entering there is not less than 10 feet at low water, and above

that for 10 miles not less than 5 feet in mid-channel." A few miles of mangroves, and then, as the banks become high, dense scrub obtains. There are fertile stretches of land on this river, though at its source, from what I have seen, there are considerable areas of sandy swamp of no value whatever.

THE JOHNSTONE RIVER SOUTH BRANCH.

About 10 miles north of the Moresby River is Gladys's Inlet, into which the Johnstone River empties its waters. Steamers of 150 tons, drawing 6 feet of water, run up the North Branch 12 miles. Geraldton, the postal town, is on the junction of the two branches, 4 miles from the mouth, and is the port and distributing centre for what settlement there is outside the two plantations—viz., Goondi and Mourilyan. The country below the town is alienated; and the banana groves and canefields give a hint at the latent powers of the district to the newcomer passing up the river. Taking the south branch first, it is navigable for punts carrying 3 tons for 6 miles above the town, and is a magnificent body of fresh water 100 yards wide and of variable depth, some reaches of the river being 30 feet deep, the sandy shallows with 2 feet or less at low tide.* The land along the banks is of splendid quality, showing from 8 to 20 feet of alluvium resting upon a red volcanic subsoil from 15 to 30 feet thick, which is superimposed upon a vesicular porous basalt, the surface of which appears parallel with the plane of the horizon. This alluvial deposit starts immediately above the township and rapidly widens on the southern bank away to the foot of the low range of hills to the eastward 1 mile distant, merging at the Mourilyan Plantation into a spacious plain of first-class agricultural land which stretches away 5 or 6 miles south, interspersed with swamps, to join the level river bottom lands on the Moresby. On the northern bank is another magnificent stretch of alluvial and volcanic soil, which is the site of the Colonial Sugar Refining Company's famous Goondi Plantation. The bananas and sugarcane along the banks will tell the land-wise observer what it is; and if he cares to go ashore and grub in farmer fashion with the heel of his boot, the sample of rich, brown loam turned up will satisfy the most critical. Every here and there can be seen vegetable gardens where paw-paws, two or three coffee bushes, oranges, cocoa-nuts, sweet potatoes, taro, yams, cassava, and limes are found growing side by side with English potatoes, peas, cabbage, lettuce (in their season), and all the other garden stuff so dear to most folk.

Five miles up the river on the south bank is situate the Mourilyan Plantation, owned by the Union Bank, and managed by J. W. Robertson, Esq.; this concern pays, and at the present price of sugar it says worlds for the management and the soil. At this point we are 7 miles from Mourilyan Harbour, the plantation being connected with the wharf there by a 2-feet light railway. Standing in the lookout on the roof of the mill-shed, a vast expanse of level country stretches away in every direction, the light green of the Mourilyan canefields, 1,300 acres in extent, appearing but an insignificant foreground to the expanse of scrub beyond—level for miles. On the opposite bank the alluvial stretches along in an unbroken sheet right back to Geraldton. With the exception of a few banana plantations, we are now about to enter the unsettled region; with level alluvial scrub on both banks, about 20 chains wide, backed by a rich chocolate volcanic loam, lying at easy slopes, say one in fifty, and cut across every half-mile by streams of purest permanent water. We are now at the head of navigation, as a rocky bar crosses the river bed, causing a series of rapids, rising, I should estimate, 10 feet in 6 chains, then clear still reaches, a mile to two miles long, from 3 to 30 feet deep; a characteristic of both branches of the Johnstone being the high banks, 40 feet above normal water level; and a point worthy of comment is that the basaltic lava through which the river has cut its bed, renders landslips and washaways impossible—a serious trouble on many rivers.

At the "old police camp," McDonnell's selection, can be seen another proof of the quality of soil and climate. In the garden (deserted for years)

*NOTE.—Salt water backs fresh up for some miles.

can be seen cocoa-nut palms 30 feet high laden with nuts, Arabian coffee and Liberian coffee literally covered and loaded with berries, with scores of seedlings germinating under the parent shrub as though in their native country, mangoes, Seville oranges, limes, Lisbon lemons, persimmons, and tea. This selection, except for the clearing round the old residence hut, is in a state of nature, in common with several other blocks ranging in size from 1,000 to 1,280 acres. One benefit is derived from these selections—viz., in almost every clearing the occupier planted a variety of trees, shrubs, and plants of commercial value; and it strikes one forcibly, when travelling about this vast scrub, leaving one clearing full of flourishing citrus fruits, coffee, &c. (though deserted for a decade), and coming across another several miles distant, giving similar indications of fertility, that had a similar clearing been made *anywhere* along the line of march, and trees, &c., planted, equally good results would have ensued. A man can travel for a week cutting his track through apparently endless scrub, either with rich alluvial flats or deep (30 feet) chocolate volcanic soil under foot, without seeing a stone for days; every acre so passed over only wants clearing and grubbing, no stones to carry off, to be ready for the plough, excepting gullies, gorges, and bluffs.

Following the windings of the river for 7 miles; up occasional rapids and along beautiful reaches of calm, deep fresh water, past numerous permanent creeks a chain wide and a yard or more deep, as yet without a name; the river banks 30 feet high, in places more, showing a section of soil which proves the surface indication of fertility—10 to 20 feet of alluvial, sometimes more, resting on volcanic red and coffee-coloured loam, 6 to 40 feet thick, the whole overlying the vesicular lava bed mentioned above.

THE CROWN LANDS OF THE SOUTH BRANCH.

At this distance up-stream, 20 miles round the bends and windings of the river bed, the South Branch is still a fine stream of fresh water, overflowing, 4 chains wide and varying from 8 to 3 feet deep, on sandy or gravelly bottom. Here, on the river and creeks, are the sites of future water-power machinery. The land on both banks retains the same characteristic as in the lower reaches in the main, excepting that the occasional palm swamps of the estuarine deposits have disappeared, and the low-lying alluvial is better drained. The surface formation is terrace-like; starting from the river bank, with a perpendicular rise of about 15 feet, then level across very rich damp alluvial deposit for 10 to 20 chains; then up a bank 15 feet of an older alluvial, rich and deep, 10 to 20 chains; then another terrace 20 feet high, 5 to 10 chains wide, formed from the detritus of the higher adjoining terrace and a very old alluvium. From this level one ascends a soil bluff, from 80 to 100 feet high, and is surprised to find it level on top. The fact is, you have reached the summit of the tableland that divides the two rivers. This divide has evidently been a large flat-topped mound of volcanic soil, through which creeks have cut their way to the river, showing a section 50 in some places 100 feet thick; uniform soil from top to bottom. Take a handful from the surface, and scramble down to the bottom of the gorge cut by the creek, and digging out a sample from the undisturbed bank one can neither see nor feel any difference in texture or quality. In many places the volcanic formation continues to the river, terminating in bluffs 150 feet high, thus prohibiting the deposit of alluvial. But continuing up the river for several miles further stretches and pockets of alluvial up to 100 acres in extent are likely to be found.

Timbers.—There are large quantities of valuable timber growing on the river—viz., Maple or Red Beech (*Flindersia Chatawaiana*), Quandong or Caloon (*Elæocarpus grandis*), Crowsfoot Elm (*Tarrieta argyrodendron*, var. *peralata*), Silky-oak (*Cardwellia sublimis*), Cudgerce (*Flindersia*, a variety of), Bean-tree (*Castanospermum australe*), White Beech (*Gmelina fasciculiflora*), and many other useful woods, a very complete catalogue of which, compiled by F. M. Bailey, Esq., is to be found in the *Queensland Agricultural Journal* of October, 1899.

An item of importance to the selector who takes a scrub farm is the cost of clearing. On the South Branch will be found an entirely different growth to be removed to what he was accustomed in the South; the alluvial being covered with a dense mass of lawyers (soft to cut), bamboo (not harder than the Southern black scrub cane), a wild climbing raspberry, bananas, and vines *ad lib.*, with clumps of trees seldom more than half-an-acre in extent. Most of the timber is softer than the general run of Southern scrub trees. The large quantity of underbrush and cane and the absence of numerous heavy logs facilitate clearing operations. Passing on to the upper reaches of the river, the country gradually rises, and the surface is broken by low, flat-topped basalt hills and their spurs, with here and there a granite mass showing through the surrounding basalt formation, all scrub-covered. Country of this nature, while not suitable in large areas for the plough, is admirably adapted for dairying, pig-farming, or the growth of coffee, tea, citrus fruits, &c., while on the northern and eastern face of the high (3,500 feet and upwards) range, which bounds the valley of the Johnstone on the south and west, are vast areas of scrub land, which, owing to their aspect, sheltered position, depth and quality of soil, are fit to grow tea and coffee and fruits temperate or tropical.

THE NORTH BRANCH.

This river is somewhat larger than the South Branch, being navigable for boats of 200 tons as far as Goondi Mill, 8 miles above the township. Opposite the town is Innisfail Plantation, which supplies cane to Goondi Mills. This property consists of some 1,300 acres, being a fine pocket in a bend of the river, and is under the management of Mr. T. Dempsey. Cane has been grown on the plantation for over fifteen successive years without manure, and still yields profitable crops. Some of the old land is being let to banana-growers, who are raising good crops of this fruit.

On the south bank, the canefields of Goondi Plantation fringe the river with green, and stretching back some $2\frac{1}{2}$ miles lies an expanse of cane land 2,000 acres in extent under cane. Much of this is under a purchasing lease to farmers, who are doing well; many of whom started with no experience and not much capital.

On the north bank, above Innisfail, are a number of 1,280-acre blocks lying round the site of the proposed Alligator Creek Central Mill site; on these blocks are some of the finest agricultural land in the colony. Here can be found large stretches of the prime river-bank land, and extensive areas of red and chocolate soils, of any depth, of basaltic origin, identical, no doubt, in constituents as well as appearance with the basaltic reds and chocolates mentioned favourably by Dr. Maxwell in his report. The rush of local cane farmers for these central mill lands is sufficient guarantee of their quality.

There are about 8,000 acres of this mill land, and as the necessary securities have been lodged with the Government, and the vote was placed on the estimate for 1900 as non-contentious, the mill is a certainty; in fact, the mill site is cleared, a wharf built, and several buildings in connection with the building have been erected. The site of the mill, which is to cost—tramways included—£45,000, is at the junction of Alligator or Victory Creek with the river; a fine position, on deep water, where a 300-ton boat can lie alongside and load sugar with a shoot. It is part of the plan of the estate to connect all the land by light railway with the mill; the level nature of the country rendering construction and carriage easy. The writer has seen, among the banana gardens on these blocks, bunches running up to twenty-five dozen bananas per bunch, and yielding 500 to 600 bunches per acre.

Further back from the river, 3 to 7 miles, over level or gently undulating country, lie large areas of Crown lands of first-rate quality: forest, grass land, and scrub, fit either for cane-growing or dairying. Continuing up the river, 8 miles, Crown lands obtain; the country, still supporting a dense

growth of scrub, is similar to the rest passed over on the river—brown, red, and chocolate basaltic soil, on the higher levels, and alluvial deposits where the nature of the river banks permit. At the 15-mile peg, on the Herberton track, 15 miles from Geraldton, where Rankin Creek runs into the North Branch, is a lot of nearly level good scrub (probably several thousand acres), from which rise low soil ridges, between which run permanent streams of purest water. On the lower part of the creeks are nice patches of alluvial, 10, 20, and may be 30 acres in extent. Several of these watercourses are up to 15 or 20 yards wide, with about a foot or more of permanent running water over the gravel banks with occasional waterfalls from 10 to 20 feet drop.

From the 17-mile hill, on the Herberton track, a good view up the river is obtained. From here to the 27-mile the country steadily rises, and the nature of the vegetation alters in proportion. The wild banana, climbing bamboo, and other evidence of tropical growth, together with the impenetrable jungle, has given place to heavy timber (of valuable varieties) and a lighter undergrowth. From here towards the top of the tableland the country becomes rangy and more granitic in character, though the flanking and overlying basalt keeps the quality of the soil fairly good. There is a very large quantity of timber growing from the 17-mile to at least the 31-mile, and running across roughly north and south, for many miles, silky oak, white beech, and maple showing logs 3 or 4 feet through and 40 feet long. Several sawmills and a swarm of bullock-driving selectors will live here some day, and, as the timber is used up, will probably develop into a farming community. Good land and water everywhere.

GOLD.—While in this part of the Johnstone district I may mention that gold has been got in payable and considerable quantities over many miles of this country. On Henrietta, Jordan, and Douglas Creeks are about 70 or 80 miners doing fairly well. Several reefs have been opened, some showing free gold in quantity. Dredging areas are about to be worked, and, as the river sands and gravel have been proved to be gold-bearing, there is some probability of this form of mining becoming an important item in a selector's plan of campaign for work or a market. Also a selector with some knowledge of fossicking can, by washing the creeks or gullies, make a little ready cash if needful.

IRRIGATION IN THE NORTH.

Mr. George Campbell, of Chiverton, has just completed the erection of a splendid pumping plant and length of fluming for the purpose of supplying his land with water from the Chiverton Lagoon. The engine, a Ruston-Proctor double-cylinder one, is the motive power by which a centrifugal 10-inch pump with 12-inch suction is kept going. The water, of which there is a bountiful supply, is raised to a flume 16 feet above the ground, and travels along the race for 460 yards, there to be liberated on to the land. The posts to support the fluming number 140, and are Moreton Bay ash, firmly let into the ground. The galvanised iron of the race is supported by sawn timber cross-pieces and uprights, very strongly and substantially built. The engine, which consumes about $2\frac{1}{2}$ tons of firewood per twenty-four hours, is capable of raising by means of the pump fully 3,500 gallons per minute, or over 5,000,000 gallons per diem, which is all let on to the land without loss from soakage or evaporation. Mr. Campbell is to be complimented on his pluck and enterprise in undertaking a work which has cost over £700, and we hope that he will be amply rewarded in the future. Meanwhile it only further serves to illustrate the confidence which a practical farmer like Mr. Campbell has in the future of this district for sugar-growing purposes. With the supply of water for irrigation purposes that we have here available, there is no limit that we can reach in the production of sugar, if we only exhibit the same sense of practical insight that Mr. Campbell has done.—*Delta Advocate*.

Science.

THE VALUE OF SOIL ANALYSIS.

Whilst Dr. Maxwell, Director of our Sugar Experiment Stations, is devoting himself to the elucidation of some of the most important problems in connection with soil analysis, more especially with a view to estimating the quantities of phosphates and potash immediately available as plant food, Dr. Dyer, in the old country, is at work on the same problems. The following article on the subject we take from the *Scottish Farmer* :—

One sometimes hears it said, "If we could only get our soils analysed it would be a great thing. Then the chemist could tell us just what manures we ought to apply." The writer has heard farmers more than once suggesting that public authorities would spend their money usefully if they could make arrangements to have soils analysed at cheap rates, as they at present have manures analysed under the Fertilisers and Feeding Stuffs Act. These ideas are founded on a very exaggerated notion of the value and usefulness of soil analysis. While soil analysis can be made of great value, especially in the study of general questions such as are dealt with at a research station like Rothamsted, it has its strict limitations when used as a guide for the farmer. In the first place, it is very difficult to get a fair sample of the soil of even an acre of ground. Much labour has been expended at Rothamsted in obtaining fair soil samples of the experimental plots. The difficulty of obtaining soil samples will be appreciated when it is remembered that there are upwards of 3,000,000 lb. of dry soil on 1 acre of ordinary land to a depth of 9 inches. How is a quite fair sample, only a pound or two in weight, to be selected from all this for the analyst? Secondly, soil analysis is a very lengthy and laborious, and therefore expensive, process. Finally, even when it is finished, the results can be used only with much caution. In the older methods of soil analysis, the analyst used drastic methods by means of heat and powerful acids to extract its constituents from the soil. But the plant roots are not in possession of furnaces and strong acids, and the phosphate and potash extracted by the analyst were not necessarily in a state to be of any use to the plant. The difficulty is to obtain an estimation of phosphates and potash in the soil in a state suitable for the use of plants. This is one of the problems at which Dr. Dyer has been working. He worked out an improved process of soil analysis in which the mineral constituents of the soil in a condition available to plants are determined, and this method has been thoroughly tested by applying it to the Rothamsted soils.

IRRIGATION DITCHES.

A good rule, says the *American Agriculturist*, is to get as much grade as possible, consistent with preservation of the ditches. In no case must the velocity be sufficient to cause destructive erosion. Some soils, being tenacious, will withstand much more water pressure than others. This must be carefully considered when the amount of water needed for a special tract of land is being figured on. Different forms of ditches and varying grades adapted to the various soils are possible. For example, $2\frac{1}{2}$ cubic feet of water a second is delivered by a ditch 3 feet wide on top, 2 feet at bottom, 1 foot deep, with a grade of 4 feet to the mile. The same amount is carried by a ditch $4\frac{1}{2}$ feet wide at top, 3 feet at bottom, $1\frac{1}{2}$ feet deep, and with a grade of 6 inches to the mile. In a soil which washes easily, the latter is the kind to build.

Agricultural Patents.

PATENTS ACCEPTED.

6664: William Gabriel Barger, of 231 Franklin street, Melbourne, Victoria, Australia, iron founder and agricultural implement maker. "An Improved Combined Roller and Cutter for Maize and other Stalks." Dated 4th June, 1902. (Drawings, 10s.; specification, 9s.)

6670: Victorian Forage Pressing Company Proprietary, Limited, of No. 112 Ryrie street, Geelong, Victoria, Australia (Assignees of James Ferrier, of Eastern Beach, Geelong, Victoria, farmer). "An Improved Forage Press." Dated 6th June, 1902. (Drawings on application; specification, 8s. 6d.)

6632: George Henry Hughes, of 155 Fenchurch street, London, England, merchant. "Improved Cattle Food." Dated 16th May, 1902. (Drawings, nil; specification, 2s.)

6633: Otto Prollius, of Copenhagen, Denmark, engineer. "Improvements in or pertaining to Bearings for Centrifugal Machines and the like." Dated 16th May, 1902. (Drawings, 10s.; specifications, 6s.)

6636: Percival James Skerman, of Harrison's Pocket, North Pine, Queensland, farmer. "An Improved Raising and Lowering Appliance in connection with Cattle-cage Dips, and for other purposes." Dated 17th May, 1902. (Drawings, 12s. 6d.; specification, 4s. 6d.)

Times of Sunrise and Sunset, 1903.

DATE.	JANUARY.		FEBRUARY.		MARCH.		APRIL.		PHASES OF THE MOON.
	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.	
1 ...	5:0	6:42	5:25	6:39	5:45	6:17	6:1	5:43	7 Jan.) First Quarter 7 57 14 " ○ Full Moon 0 17 20 " ☾ Last Quarter 9 49 29 " ● New Moon 2 39
2 ...	5:0	6:42	5:25	6:38	5:46	6:16	6:1	5:42	
3 ...	5:1	6:42	5:25	6:38	5:46	6:14	6:3	5:40	
4 ...	5:1	6:42	5:27	6:37	5:47	6:13	6:3	5:38	
5 ...	5:3	6:43	5:28	6:36	5:48	6:12	6:4	5:38	
6 ...	5:3	6:43	5:29	6:36	5:49	6:11	6:5	5:37	5 Feb.) First Quarter 8 13 12 " ○ Full Moon 10 58 19 " ☾ Last Quarter 4 23 27 " ● New Moon 8 20
7 ...	5:3	6:43	5:31	6:34	5:49	6:9	6:6	5:36	
8 ...	5:5	6:43	5:32	6:33	5:49	6:8	6:6	5:34	
9 ...	5:6	6:44	5:32	6:32	5:50	6:7	6:7	5:33	
10 ...	5:7	6:44	5:33	6:31	5:51	6:7	6:7	5:33	
11 ...	5:7	6:44	5:33	6:31	5:51	6:6	6:7	5:32	7 Mar.) First Quarter 5 14 13 " ○ Full Moon 10 13 21 " ☾ Last Quarter 0 8 29 " ● New Moon 11 26
12 ...	5:8	6:44	5:33	6:31	5:52	6:5	6:7	5:31	
13 ...	5:9	6:44	5:34	6:30	5:52	6:4	6:8	5:30	
14 ...	5:10	6:44	5:34	6:30	5:53	6:3	6:9	5:29	
15 ...	5:11	6:43	5:35	6:29	5:53	6:1	6:9	5:27	
16 ...	5:11	6:43	5:36	6:28	5:54	6:1	6:9	5:27	5 Apr.) First Quarter 11 51 12 " ○ Full Moon 10 18 20 " ☾ Last Quarter 7 30 27 " ● New Moon 11 31
17 ...	5:11	6:43	5:37	6:27	5:55	6:0	6:9	5:27	
18 ...	5:13	6:43	5:39	6:26	5:55	5:58	6:10	5:26	
19 ...	5:13	6:43	5:40	6:25	5:55	5:57	6:10	5:25	
20 ...	5:14	6:43	5:41	6:23	5:56	5:56	6:10	5:24	
21 ...	5:15	6:43	5:41	6:23	5:57	5:55	6:10	5:23	
22 ...	5:16	6:42	5:41	6:22	5:57	5:53	6:11	5:22	
23 ...	5:18	6:42	5:42	6:22	5:58	5:53	6:12	5:21	
24 ...	5:18	6:42	5:42	6:22	5:58	5:52	6:12	5:20	
25 ...	5:19	6:41	5:42	6:20	5:58	5:50	6:13	5:19	
26 ...	5:19	6:41	5:42	6:20	5:58	5:49	6:13	5:18	
27 ...	5:20	6:41	5:43	6:19	5:59	5:48	6:14	5:17	
28 ...	5:21	6:41	5:44	6:18	6:0	5:48	6:15	5:16	
29 ...	5:22	6:40	...	...	6:0	5:46	6:16	5:15
30 ...	5:23	6:39	...	...	6:1	5:45	6:17	5:15
31 ...	5:23	6:39	...	...	6:1	5:45	...	...

Statistics.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE TOTAL RAINFALL FOR EACH MONTH OF THE YEAR IN THE AGRICULTURAL DISTRICTS OF QUEENSLAND.

STATIONS.	1901.	1902.											
	Dec.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
<i>North.</i>													
Bowen ...	0.71	0.19	2.19	2.01	0.68	NIL.	0.44	0.11	0.02	NIL.	0.06	0.06	3.16
Cairns ...	2.78	3.79	12.90	11.43	3.48	2.34	4.97	3.87	0.95	NIL.	0.16	1.38	5.15
Aeraldton ...	1.60	3.78	16.87	7.55	12.83	5.39	8.10	7.32	1.77	NIL.	0.29	0.44	5.53
Herberton ...	1.30	0.57	5.77	3.86	1.54	1.07	1.58	2.05	0.08	NIL.	0.93	1.13	7.02
Hughenden ...	1.43	1.57	2.02	0.53	*	NIL.	NIL.	NIL.	NIL.	NIL.	0.05	0.22	2.77
Kamerunga ...	2.16	2.58	10.59	14.24	3.40	2.63	5.12	4.00	0.81	NIL.	0.29	1.57	3.79
Longreach ...	1.71	0.87	0.27	0.18	0.03	0.03	NIL.	NIL.	0.05	NIL.	NIL.	1.27	1.56
Incinda ...	0.32	3.55	11.38	2.67	1.78	*	0.63	0.21	0.45	NIL.	0.22	0.10	2.47
Mackay ...	0.71	3.78	8.43	4.41	6.73	1.26	2.33	0.59	0.80	NIL.	0.17	0.35	7.71
Rockhampton ...	0.19	4.79	1.36	1.68	0.21	NIL.	NIL.	NIL.	0.09	1.41	0.05	0.51	5.60
Townsville ...	0.61	2.24	3.14	1.61	0.35	0.04	0.10	NIL.	0.10	NIL.	0.29	0.08	6.50
<i>South.</i>													
Barcaldine ...	0.09	2.39	0.07	0.37	0.02	NIL.	NIL.	NIL.	0.08	0.02	0.21	0.95	6.41
Beenleigh ...	0.14	2.41	1.82	0.68	0.42	NIL.	0.11	0.63	0.49	0.28	2.92	3.36	1.83
Biggenden ...	0.92	2.12	0.83	1.80	0.65	NIL.	0.04	0.08	0.04	1.58	2.34	0.25	8.98
Blackall ...	0.32	1.68	0.34	0.34	0.05	NIL.	0.01	0.01	0.21	0.27	0.12	1.05	4.61
Brisbane ...	0.75	1.38	2.67	0.76	0.17	0.47	0.06	0.55	0.98	1.30	3.42	2.59	1.82
Bundaberg ...	NIL.	6.33	0.75	1.99	0.43	0.02	NIL.	0.07	0.13	0.31	1.24	0.65	1.38
Caboolture ...	3.45	2.29	2.66	1.29	1.99	NIL.	0.03	0.20	0.05	1.09	2.30	3.17	1.74
Charleville ...	0.96	0.47	0.22	0.42	0.23	NIL.	0.12	NIL.	1.04	0.30	1.05	2.14	4.79
Dalby ...	0.42	1.65	0.20	0.30	2.00	NIL.	0.15	NIL.	0.41	0.70	3.14	2.79	3.29
Emerald ...	0.63	3.28	1.11	0.97	0.30	NIL.	0.01	NIL.	NIL.	0.02	0.01	1.58	8.42
Esk ...	2.20	1.81	1.06	0.75	1.25	NIL.	0.04	0.25	0.15	0.64	0.93	4.00	7.67
Gatton College	0.26	2.27	1.58	0.26	*	0.04	0.03	0.04	0.64	0.73	2.41	3.72	5.14
Gayndah ...	0.38	2.54	0.51	0.99	0.81	0.29	NIL.	NIL.	0.05	0.64	2.10	2.08	3.37
Gindie ...	0.57	1.35	1.46	0.78	0.47	NIL.	NIL.	NIL.	NIL.	0.10	NIL.	1.65	7.14
Goondiwindi ...	0.20	2.08	0.75	1.20	0.06	0.02	0.41	NIL.	1.19	0.21	1.50	0.59	2.21
Gympie ...	1.25	1.49	1.65	2.33	1.09	0.23	NIL.	0.36	0.94	1.38	3.80	1.40	4.32
Ipawich ...	0.35	1.45	2.80	0.32	0.03	0.02	0.15	0.31	0.77	0.30	2.86	3.45	1.84
Laidley ...	1.65	1.79	1.94	0.39	0.10	0.20	0.06	NIL.	0.40	0.89	2.21	3.27	5.13
Maryborough ...	1.54	1.29	0.75	0.93	1.57	0.36	0.24	0.29	0.57	0.69	0.91	1.11	4.02
Nambour ...	3.89	1.30	2.06	1.61	†	0.26	0.04	*	0.70	0.35	1.26	1.66	2.64
Nerang ...	0.46	3.98	4.54	0.65	0.65	0.35	0.52	1.07	1.22	1.17	3.15	1.75	1.73
Roma ...	0.83	2.72	1.11	0.54	0.15	NIL.	0.20	NIL.	0.46	0.35	0.92	0.86	2.35
Stanthorpe ...	1.67	3.17	0.51	0.56	0.10	0.87	0.78	0.15	0.94	0.85	2.29	3.98	1.75
Tambo ...	0.16	1.73	0.35	0.68	0.04	NIL.	0.01	NIL.	0.23	0.06	0.41	1.34	4.14
Taroom ...	0.31	0.53	1.82	1.30	0.33	NIL.	NIL.	NIL.	0.17	0.45	0.68	1.40	2.88
Tewantin ...	2.70	3.09	1.13	3.44	2.84	0.80	0.91	0.91	0.85	0.87	1.94	1.96	1.35
Texas ...	0.43	1.95	1.62	0.42	NIL.	NIL.	0.88	NIL.	1.57	0.13	2.42	1.67	1.42
Toowoomba ...	0.87	3.46	1.20	NIL.	0.79	0.03	0.38	0.19	0.56	0.37	3.07	3.18	6.99
Warwick ...	0.71	3.48	0.65	0.55	NIL.	0.15	0.63	0.20	0.94	0.43	2.96	2.87	4.61
Westbrook ...	0.31	3.21	1.04	0.06	0.41	NIL.	0.28	0.06	0.29	0.38	3.20	3.34	3.37

CLEMENT L. WRAGGE,

Wragge's Weather Bureau.

PRICES IN BRITISH MARKETS OF ARTICLES WHICH CAN BE PRODUCED IN QUEENSLAND.

BUTTER.—New Zealand, choicest, 112s. to 116s.; Danish and Swedish, choicest, 116s. to 118s.; finest, 112s. to 114s.; Canadian, choicest, 102s. to 104s.; finest, 96s. to 100s. per cwt.

CHEESE (duty free).—American, 56s. to 58s.; Canadian, 59s. to 60s. per cwt. Australian and New Zealand, no quotation.

CONDENSED MILK.—18s. 6d. to 20s. 6d. per case in 20-case lots.

SUGAR (duties, raw, 2s. to 3s. 10d.; refined, 4s. 2d. and $\frac{1}{2}$ per cent.).—Refined, £15 to £18; raw, £11 to £15 9s. per ton. German beet, 88 per cent., 7s. 10d. per cwt.

MOLASSES (duty, 2s. per cwt. and $\frac{1}{2}$ per cent.).—5s. 9d. to 8s. 6d. per cwt.

RICE (duty 5d. per cwt.).—Rangoon, £8 to £14 10s.; Japan, £12 10s. to £17; Java, £18 to £24; Patna, £17 to £21 per ton.

COFFEE (in bond, duty 1½d. per lb. and ¼ per cent.).—Ceylon plantation, 45s. to 120s.; peaberry, 74s. to 123s.; Santos, 28s. to 58s.; Mocha, 55s. to 70s.; Jamaica, 31s. to 124s. per cwt.

ARROWROOT (duty, 5d. per cwt.).—Bermuda, 1s. 3d. to 1s. 6d.; St. Vincent, 3d. to 5½d.; Natal, 5d. to 8d. per lb.

WHEAT.—Manitoba, 31s. to 32s. 6d. per 496 lb.

FLOUR.—28s. to 31s. per 280 lb.

MALTING BARLEY.—27s. 6d. to 30s. per 448 lb.

OATS.—New Zealand, 26s. to 28s. per 384 lb.

SPLIT PEAS.—45s. per 504 lb.

GINGER.—Japan, 35s. to 36s.; Jamaica, 50s. to 55s. per cwt.

PEPPER.—Black, 5½d. to 6½d.; white, 9d. to 9½d. per lb.; capsicums, 16s. to 80s.; chillies, 34s. to 40s. per cwt.

TOBACCO.—American. Messrs. Edwards, Goodwin, and Co., Liverpool, report as follows on the Tobacco Trade:—

STRIPS.	1902.	1901.	LEAF.	1902.	1901.
WESTERN—			WESTERN—		
Fillers	— @ 5 @ —	4 @ —	Common export ...	— @ 5 @ 6½	— @ 5 @ 6½
Rather short	5½ @ 5½	5 " 6	African export ...	— @ 5 @ 6½	— @ 5 @ 6½
Very middling to middling	6½ " 6½	6½ " 7	Short trade ...	4 " —	3½ @ 4
Good to fine	7 @ 8 @ —	— @ 7½ @ 8	Medium to good trade	4½ " 6	4½ " 6
BURLEY	6 " 8 " —	5½ " 8 " 11	BURLEY	6½ @ 7½ @ 8	7 @ 7½ @ 8
VIRGINIA DARK—			VIRGINIA DARK—		
Fillers	5½ @ 6	4½ @ —	Common export ...	— @ —	— @ —
Rather short	6 " 6½	5 " 5½	Short trade ...	— " —	— " —
Very middling to middling	6½ " 7½	6½ " 7½	Medium trade ...	4 " 5	4 " 5
Good to fine	8 " 10	8 @ 9 @ —	Good to fine trade ...	5½ " —	5½ " —
VIRGINIA and CAROLINA			VIRGINIA and CAROLINA		
BRIGHT—			BRIGHT—		
Semi-dark	— @ 8	— @ 5½	Common or semi-bright	7 " 8	— @ 6
Semi-bright	8½ @ 9 @ —	5½ @ 7 @ —	Medium or mixed ...	8½ @ 10 @ —	6½ @ 8½ @ —
Medium or mixed ...	10 @ 11	8 @ 9	Good to fine ...	11 " 12 " 15	10 " 11 " 15
Good to fine	11½ @ 12½ @ 14	9½ @ 11½ @ 13			

The market opened with a better feeling this month (October), and rather more business began to be done, but the cutting in prices of the manufactured article soon recommenced, making buyers feel so uncertain as to the future that they ceased to operate for the time; however, the month closes with more inquiry again, the trade having to a certain extent got over its disappointment.

Prices keep steady all round, which is not to be wondered at, as it would be impossible to duplicate the greater part of the offerings on this market from the States at present with stock of equal quality or value.

WINES.—Australian Burgundy, red, 18s. per dozen; quart flagons, 17s. to 23s. per dozen.

GREEN FRUIT.—Oranges, 8s. 6d. to 25s. per case; lemons, 10s. to 25s. per case; bananas, 9s. to 12s. 6d. per bunch; apples, American, 18s. to 26s. per case; grapes, 12s. to 30s. per barrel.

COTTON.—Uplands, 4½d.; Sea Island, 8d. to 9d. per lb.

COTTON SEED.—No quotation.

COTTON-SEED OIL CAKE.—£6 10s. to £7 2s. 6d. per ton.

COTTON-SEED OIL.—20s. 3d. to 22s. 6d. per cwt.

LINSEED.—44s. 6d. to 50s. per 410 lb.

LINSEED OIL.—23s. to 23s. 3d. per cwt.

LINSEED OIL CAKE.—£7 5s. to £7 10s. per ton.

MANILLA HEMP.—£25 to £30 per ton.

NEW ZEALAND HEMP.—£33 10s. per ton.

SISAL HEMP, QUEENSLAND.—A sample manufactured at St. Helena Penal Establishment was valued in Melbourne at £35 per ton. A good market exists there for large quantities of sisal hemp.

FROZEN MEAT.—The following are the Frozen Meat Trade Association's Smithfield market quotations for the undermentioned classes of frozen meats, based on actual sales of not less than 100 carcasses of mutton or lamb, or 25 quarters of beef of fair average quality. These quotations are not for selected lines, but for parcels fairly representative of the bulk of the shipments now on the market:—

New Zealand Sheep.
(Crossbred Wethers and Maiden Ewes.)

	Jan. 10.	Jan. 17.
Canterbury, light (48 lb. to 56 lb.)	5 $\frac{1}{4}$ d.	5 $\frac{1}{4}$ d.
Canterbury, medium (56 lb. to 64 lb.)	5 $\frac{1}{4}$ d.	5 $\frac{1}{4}$ d.
Canterbury, heavy (64 lb. to 72 lb.)	5 $\frac{1}{4}$ d.	5 $\frac{1}{4}$ d.
Dunedin and Southland (56 lb. to 64 lb.)	—	5d.
North Island (55 lb. to 65 lb.) ...	5d.	4 $\frac{3}{8}$ d.

Australian Sheep.
(Crossbred and Merino Wethers.)

Heavy (over 50 lb.)	—	None offering.
Light (under 50 lb.)	—	None offering.

River Plate Sheep.
(Crossbred and Merino Wethers.)

Heavy (over 50 lb.)	4 $\frac{7}{16}$ d.	4 $\frac{3}{16}$ d.
Light (under 50 lb.)	4 $\frac{7}{16}$ d.	4 $\frac{3}{16}$ d.

New Zealand Lambs.		
Canterbury, light (28 lb. to 36 lb.)	5 $\frac{1}{4}$ d.	6 $\frac{1}{4}$ d.
Canterbury, heavy (36 lb. to 42 lb.)	5 $\frac{3}{4}$ d.	6 $\frac{1}{2}$ d.
Dunedin and Southland (28 lb. to 42 lb.)	5 $\frac{5}{8}$ d.	6d.
North Island (28 lb. to 42 lb.) new season's	—	6 $\frac{1}{4}$ d.

Australian Lambs.		
30 lb. to 40 lb.	5 $\frac{1}{4}$ d.	5 $\frac{1}{4}$ d.

River Plate Lambs.		
30 lb. to 40 lb.	—	None offering.

New Zealand Frozen Beef.

Ox, fores (180 lb. to 220 lb.)	—	3 $\frac{5}{8}$ d.
Ox, hinds (180 lb. to 220 lb.)	—	4 $\frac{3}{8}$ d.

(Quotations nominal.)

Australian Frozen Beef.

Ox, fores (160 lb. to 200 lb.)	—	3 $\frac{5}{16}$ d.
Ox, hinds (160 lb. to 200 lb.)	—	4d.

River Plate Frozen Beef.

Ox, fores (160 lb. to 220 lb.)	3 $\frac{5}{16}$ d.	3 $\frac{5}{16}$ d.
Ox, hinds (160 lb. to 220 lb.)	4 $\frac{1}{8}$ d.	4 $\frac{3}{16}$ d.

These prices are the official quotations furnished by the Frozen Meat Trade Association. The basis of quotations is sales of lines of not less than 100 carcasses of mutton or lamb, or twenty-five quarters of beef. All the quotations for mutton are for average quality. Quotations of Australian and New Zealand lambs do not include sales of small lambs or heavies or inferior quality.

EGGS.—French, 14s. 6d. to 15s.; Danish, 12s. to 14s. 6d. per 120.

BACON.—Irish, 60s. to 63s.; American, 62s. to 64s.; Canadian, 59s. per cwt.

HAMS.—Irish, 86s. to 112s.; American, 64s. to 70s. per cwt.

TALLOW.—Beef, fine, £35 15s.; medium, £31 10s.; mutton, fine, £36 10s.; medium, £32 10s. per ton.

General Notes.

PHYLLOXERA DEFEATED.

It has been reported to the Academy of Science, at Paris, by M. Dubois, that he has succeeded in discovering a micro-organism which kills phylloxera and kindred pests. The bodies of the insects so killed contained when inspected a great many bacteria; but the poisonous qualities of the organisms seem to differ according to the nature of the soil and the weather. Dubois placed two roots of vines containing phylloxera upon blotting-paper, and sowed bacteria on to them. Eight other roots he put into vessels filled with earth, and sowed bacteria on these also. After two days all the phylloxera were dead on the two roots on the blotting-paper; after five days on the eight roots; while those two roots which had not received any bacteria had plenty of living phylloxera on them. Others could also detect bacteria within the bodies of the dead phylloxera in some instances.

WRINKLE WITH TOMATO PLANTS.

An Iowa Homestead correspondent sketches his plan of setting out tomato plants:—I let the plant get a good size, and then I set it deeply in the ground and cover the stem on an incline, usually leaning to the north. A reservoir is left for watering the plant. Give 1 quart of water to each plant when set, another the next evening, and the next morning fill the hole full of dirt. Every joint on the stalk will put out roots, and heat and moisture will start nearest the surface first. The plant will withstand whatever season may come. If the season is wet, the upper roots will push the plant along; if dry, the lower stratum will not let growth check.

TOMATO JAM.

Peel ripe tomatoes and take out all the seeds. Put the tomatoes into a granite kettle with $\frac{1}{2}$ -lb. of sugar and juice of half-a-lemon to each pound of prepared tomato. Boil slowly, adding a little water now and then. When it has boiled for three hours add the grated rind of the lemons, and one cup strained honey for every one quart tomato. Boil half-an-hour longer, and then put into glasses.

TO CURE CORNS.

1. Place on the corn a piece of cold, moist linen folded several times, wrap it up in dry linen, then go to bed. With this treatment the hard epidermis swells up, and after six or eight hours the outer covering of the corn can be removed with a dull knife. When this treatment has been followed for three or four days, a small needle-like growth (the corn) can be extracted without pain or bleeding. By washing the feet often in cold water the tender place will heal rapidly. After getting rid of this corn it is well to wear shoes which are neither too large nor too small, so as to avoid excessive pressure or friction.
2. In place of the linen a crust of bread soaked in vinegar may be applied.
3. The best application is to soak a whole onion twenty-four hours in vinegar, then apply one of the layers of the onion to the corn and keep it in place by a bandage through the night. After repeating this procedure a few times, the corn can be removed without any trouble. By either of these simple applications this troublesome agent can be removed without any danger of blood poison, and "free of charge."—*Exchange*.

EFFECT OF FLOWERING OF POTATOES.

A German scientist some time since wrote a pamphlet in which he described experiments he carried out with a view to ascertaining whether blossoming is detrimental to the development of potato-tubers. He found that the efforts of the plant to provide for its reproduction by means of seeds seemed to result in a corresponding weakness in its root growth and the size and numbers of the tubers. The experiments were carried out on a number of plots on similar soil, every condition being exactly the same. On one plot the plants were allowed to bloom as much as they liked; the blooms of the other plots were cut off at different times. The crop that had not been topped at all was the worst yield, and the best crop was the one that had been prevented from blooming by being topped at frequent intervals. Those that were topped at the latest stage of the plant's growth were not so satisfactory as in the case of the crop frequently topped off.

PROPAGATING MANGO SEEDS IN PICKLE BOTTLES.

Last year we published a suggestion by Mr. C. Acutt, of Rockhampton, to the effect that mango seeds might be easily sprouted in pickle bottles. Mr. Acutt put three mango seeds in an empty pickle bottle, corked up the latter, and in less than four weeks the seed sprouted and sent out roots. We tried the plan, and found it quite successful. Now we are informed by Mr. G. H. Miller, of Mount Morgan, that he tried the method two months ago, and has just planted out one seed with a stem fully 4 inches high. The other two are not so forward, having no stems, but their roots are over 3 inches in length.

There is no doubt that mango seeds may be sent from India and Java in this manner to Australia, and would be ready to plant out on arrival. It might even be possible to introduce the mangosteen in bottles.

TO PICKLE ONIONS.

The small silver onions are the ones generally used for pickling. Peel the onions until they look clear, being careful not to cut the bulb. If a little warm water be poured over them, the task will not be quite so disagreeable. Throw them as they are peeled into a bowl of white-wine vinegar, and when they are all finished strain the vinegar into an enamelled stewpan, with 1 ounce of whole peppercorns, a dessertspoonful of salt, and 1 inch of whole ginger to each quart. Boil gently for five minutes, let the liquid cool, and pour it over the onions. It must be boiled again twice before the onions are fastened up, and should be sufficient to cover them entirely. Put the pickle into jars, cork securely, and cover them with bladder; then store for use. If preferred, instead of boiling the vinegar three times, the onions may be thrown into it when boiling, and simmered gently for two minutes.

CATTLE THAT NEVER DRINK.

There are, says an exchange, hundreds of horses and thousands of cattle in the Hawaiian islands which never take a drink of water throughout the whole course of their lives. On all islands the upper altitudes of the mountains are given up to cattle ranges. The cattle run wild from the time they are born until they are sent to the slaughter-house. Except possibly two or three months in the rainy season, there are no streams or pools of water in any part where the cattle range, but everywhere grows a recumbent, jointed grass known by the native name of "maninia." This is both food and drink.

[The jointed grass here alluded to is nothing but buffalo grass, which can hardly furnish so much moisture as to serve the purpose of a babbling brook. Horses and cattle in Queensland are not at all partial to buffalo grass in good seasons when other grasses are plentiful.—Ed. *Q.A.J.*]

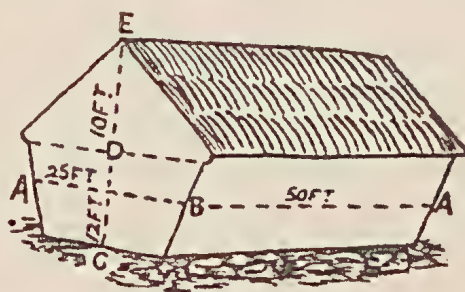
YARD GATE SPRING.



I send a sketch showing a yard gate spring which I think beats anything that can be bought. It is a hay rake tooth with a hole punched in the pointed end. Bolt the other end to the fence about 12 or 14 inches from the post and fasten the pointed end to the gate on top of the cross piece, about 1 foot from the hinge, or so it will hold the gate shut. You will find that you have a spring as perfect in every respect as can be. It holds the gate tight shut, and is easily opened and not in the way in passing through. It is a very practical device.—*Station, Farm, and Garden.*

TO FIND THE CONTENTS OF A STACK OF HAY.

1. Measure length and breadth of stack in feet halfway between the ground and the eaves, from A to B, as per sketch.
2. Height of stack from ground to eaves, C to D.
3. Height from eaves to ridge-cap, D to E.
4. To the number of feet between C and D add half the number of feet D to E, which will give the average height.
5. Multiply length, breadth, and average height together, which will give total cubic feet.



6. Divide the result by 27, bringing it into cubic yards.
7. For loose hay not less than 18 cubic yards (or say 500 cubic feet) to the ton must be allowed. For sheaved hay not less than 13 cubic yards (equal, say, 350 cubic feet), according to size of the stack. For small stacks of loose hay 20 cubic yards to the ton should be allowed.

Divide cubic yards by the above; the result will give net contents of stack in tons.

Example—

$$50 \times 25 \times 12 \text{ to eaves.}$$

$$25 \quad 5 \text{ to ridge.}$$

$$\begin{array}{r} 250 \\ 100 \end{array}$$

$$\begin{array}{r} 1250 \\ 17 \end{array}$$

$$\begin{array}{r} 8750 \\ 1250 \end{array}$$

$$27)21250 \text{ cubic feet}$$

$$20) \quad 787 \text{ cubic yards}$$

$$39.7$$

Contents of above stack, 39 tons 7 cwt.

SUNSTROKE.

From a photographic journal we take the following item, which deserves attention from all whose avocations necessitate their being exposed to the blazing rays of a summer sun. The recent lamentable loss of life in the Clarence River district and in parts of Queensland from sunstroke might possibly have been avoided had some such precaution been taken as is here indicated. The journal in question says :—

IS SUNSTROKE A PHOTOGRAPHIC EFFECT ?

If we consider the fact that no one gets heat-stroke from the great heat of furnaces in an arsenal, we readily arrive at the conclusion that not the heat rays of the sun but the actinic rays are the cause of the evil. Hence, if we treat the body as a photographer treats his plates, and envelop it in orange, using always an orange-yellow shirt, and lining the coat and hat with flannel of the same colour, we are likely to suffer no bad effects from the sun. Acting on this hint, officers in India who have to perform a march in the hot weather use an orange-yellow shirt, and line the helmet with orange-yellow flannel, and have a pad of the same colour stitched into the khaki coat down the back. As a further precaution, the helmet might be lined with a layer of tinfoil.

TO PREVENT DROWNING.

If people unable to swim could only be persuaded how very buoyant is the human body, and how exceedingly simple it is to keep that body afloat, we should not hear of so many distressing cases of drowning, especially inland in lagoons and rivers. There is a small hollow at the back of the head near the base of the skull. That little hollow has power to sustain the whole of the body in the water. Fold the arms or let them hang down by your side, and allow your body to steadily assume an upright position in the water, at the same time throw the head well back. The result will be that the mouth and nose are above the surface and will remain so, provided the hands are not raised out of the water. The moment that happens the body will sink. Another plan is to lie flat on your back, throwing your arms at full stretch behind your head, or even folding the hands at the back of the head. Lie quite still, and you cannot sink. It is surprising what a little floating object will sustain in the water. Take a small pumpkin and hollow it out. When out of your depth grasp it in both hands ; you will find that it will keep you afloat. An empty beer bottle or a bit of board will serve the same purpose. When a boat capsizes, never try to get into it, but if it floats gunwale uppermost catch hold of the gunwale lightly with one hand. Twenty people can be kept thus above water by a submerged boat which would not hold one person in addition to the water in it. Keep cool, and never throw up your hands. If you keep your hands under, even although you cannot swim, you will discover that you can keep up by "dog-paddling" under water.

OILING HARNESS.

Take a common-sized sheet-iron tub and fill it 2 or 3 inches deep with oil, such as is commonly used for oiling mowers and binders, that will cost 20 to 40 cents per gallon and require about two or three gallons to a tub. Dip all parts of harness, bridle lines, and other leather so as to cover well in the oil, allowing time to get well saturated, say five to ten minutes, after which hang up over the tub to drip, and when dripped off rub well all parts with any kind of a coarse cloth, and the harness will be as soft and pliable as a cloth. No fear of mice ever eating harness oiled with machine oil. If leather is very dirty, it should be washed and well dried before oiling. What oil is left can be juggled up and kept for another oiling. It will be seen that the cost is little compared with the benefit in the leather saving. The tub can be washed out, and be none the worse for oiling.

TO MAKE BUSH SOAP.

A correspondent of *Garden and Field* gives the following recipe:—

The first advice is not to try and make caustic lye from ashes and lime, but to get reliable caustic soda. Greenbank's 98 per cent. caustic soda is the right thing.

Next, get a Beaume densometer to test the strength of the lye, and so work on certain lines. Take 30 lb. pure tallow, 10 lb. resin, about $4\frac{1}{2}$ lb. 98 per cent. caustic soda. Powder the resin finely, then melt the tallow, and while this is kept hot stir in the resin until it is melted and well mixed.

Dissolve the caustic soda in about three gallons of water, making the lye to test 30 degrees Beaume.

While the fat and resin are in a hot, melted condition pour in the lye and keep the mixture stirred, and at a temperature of 180 degrees Fahr., or a little below boiling for two hours, testing the soap from time to time on the tongue. If all trace of alkali (caustic) disappears, add more lye until the soap when applied to the tongue gives a slight biting sensation. If the alkali is too pronounced, add more tallow and stir well to ensure perfect mixing.

A good newly-boiled soap should bite the tongue about as sharply as vinegar; but, as it is kept and matures, this, to a certain extent, passes away.

CANDIED PEEL.

Cut your fruit in halves or quarters, and take out the pulp. Soak the peel in salt and water until the bitterness is drawn out, then in fresh water for some hours to take out the excess of salt. Then boil gently until the peel is quite tender. This is the preparatory work. It now remains to replace the water in the peel with sugar, and this is done by boiling several times in syrup. For the first boiling make the syrup fairly weak, using white crystal sugar—say, 2 lb. to the gallon. Take out the peel and let it drain, and add sugar to double the strength of the syrup, and boil gently again. Repeat the operation, making the syrup strong. Take out the peel and place cup, side up, on a board or wire to drain and dry, partly filling the cup with strong syrup, which when dry will form a cake of sugar.

SPRAYING TO KEEP OFF FROST.

From time to time we (*Agricultural Gazette*, Tasmania) have noted the experiments made to determine the value of spray as a means of keeping off frost in late spring and early fall. In the orange groves of Florida it has been successfully done at different times. The film of water keeps the temperature inside the fruit or leaf or twig from falling too low, and this is effective in keeping off frost, if the latter is not too severe. Most of the frosts that do great damage are light frosts coming very late in the spring or very early in the fall and catching the tender vegetation. In New York State this practice is coming into vogue for protecting vineyards. A number of grape-growers have this spring sprayed their vines at times of heavy frost, and have thus saved their crops. We do not see why the remedy would not be as effective in the early fall as in the late spring. Doubtless the plan is worthy of extended attention.

STANTHORPE SHOW.

The Secretary of the Border Agricultural, Horticultural, Pastoral, and Mining Society notifies that the Annual Show of the Society will be held on Thursday and Friday, the 12th and 13th of February instant.

AGRICULTURAL AND HORTICULTURAL SHOWS.

The Editor will be glad if the secretaries of Agricultural and other Societies will, as early as possible after the fixture of their respective shows, notify him of the date, and also of any change in date which may have been decided on.

Answers to Correspondents.

PRESERVING EGGS IN LIME WATER.

NEW SUBSCRIBER, Nerang.—The lime water is very easily prepared. Slake about 3 lb. of lime in 4 gallons of water. Or slake 1 lb. of lime with a small quantity of water, and stir this milk of lime into 5 gallons of water. Let it settle. In a few hours, pour off the clear liquid into a jar or some vessel which can be covered. It is necessary to exclude the air from the vessel as much as possible, otherwise the lime held in solution in the water will be precipitated as carbonate of lime, and the preservative action is lost. The eggs placed daily in the jar must be *absolutely fresh*, and no cracked egg must be put in. If you notice any lime sinking to the bottom of the jar, get a fresh lot of lime water ready and draw off the old by means of a kerosene pump, or, better and easier still, by a siphon, as here illustrated. When using the siphon, fill the tube with water, keep your fingers on the lower end. Then plunge the short leg into the liquid to be removed, and it will run till the vessel is empty or until the leg of the siphon cannot reach the water.

Keep your egg vessel in as cool a place as possible, and, if you manage well, the eggs will keep fresh for twelve months.

WATERPROOF CALICO—SPRAYING MELONS—A FENCING QUESTION.

CORNSTALK, Georgetown—

1. There are several processes for rendering calico waterproof. A coating of boiled linseed oil containing a little turpentine is a good plan. Another is the alumina soap method. This consists in passing the calico first through a warm soap bath (1 lb. to the gallon), then through an alum bath of the same strength, followed by passing the stuff through the mangle. There will be no appearance of any coating, as the alumina soap is in the fibre itself. This metallic soap is excellent for the purpose.

2. Use Paris green in the proportion of 1 oz. to 10 gallons of water. Or, mix 1 oz. of Paris green with 5 lb. of air-slaked lime, and give the plants a dusting with this. With regard to danger to human beings from poison, experiments made at the Colorado (U.S.A.) Experiment Station point to the absolute harmlessness of such spraying. The insects are all killed in two or three days, and the average amount of poison on each plant will be less than one-tenth of a grain. An ounce of the Paris green will serve for twenty-eight head of cabbages, giving one-seventh of a grain to each, so that to get a poisonous dose a person would require to eat twenty-eight cabbages at once. Of course, you would wash the melons when picking them.

3. Without a special clause in the agreement to the effect that any fencing done by the lessee would be paid for by the owner of the land, you cannot compel him to pay for any fencing you have erected, neither may you remove it without the landlord's permission.

SPINIFEX FOR HAY AND SILAGE.

FORTIS, Prairie, Townsville.—Spinifex is utterly valueless for the purpose of making hay or silage. It is too harsh and spiny. There is a spinifex growing on the Warrego which stock will nibble at when it is quite young, but as it grows older it is less nutritious than even blady grass.

MAIZE IN THE ARGENTINE.

R. AND H. WITTY, Yatala.—We have not yet been able to obtain the information you require.

MANURE FOR POTATOES.

C. N. FARMER, Crow's Nest.—Try 4 to 5 cwt. wood ashes, 4 cwt. superphosphate or bonedust, and 1 cwt. nitrate of soda, cost about £2 5s.

Another good mixture is:—

Superphosphate, 280 lb.

Sulphate of ammonia, 125 lb.

Sulphate of potash, 115 lb.

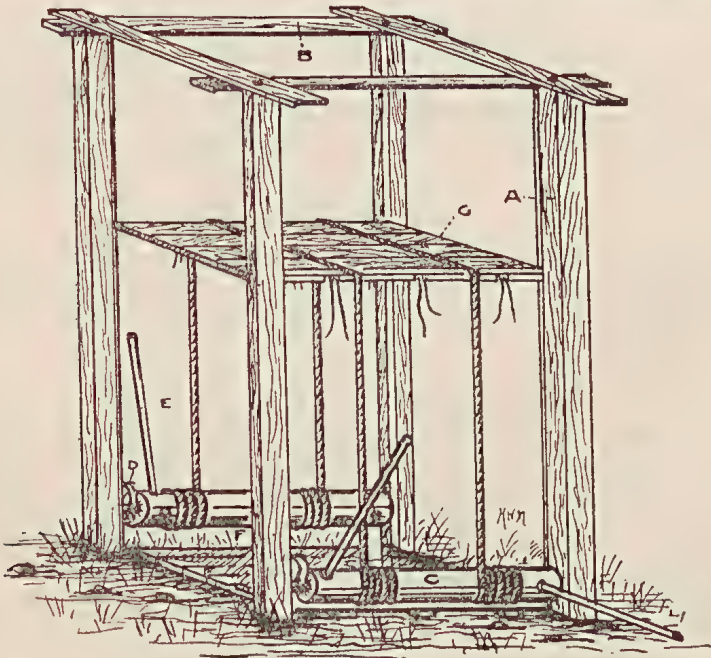
The cost of this mixture would be about £2 5s. Kainit may take the place of the sulphate of potash, but it is bulky. You would require 500 lb. of it, and the cost would be about £1. It is, moreover, said to have a bad effect on the tubers.

THE RADIATOR.

DAIRYMAN, North Pine.—The agents in Brisbane for the Radiator are Messrs. Brown, Webb, and Co. The size of the machine ranges from 50 gallons to 400 gallons per hour for power machines and 20 gallons for hand driven. Prices from £2 11s. to £7 15s.

HAY PRESS.

DAIRYMAN, Bowen.—Roughly square four posts (A) about 12 feet long. Strut them onto a cross piece of stout timber, and put in about 3 feet in the ground. Brace them firmly together at the top by the plates (B). Into



the lower portion of the posts at back and front, let in two windlasses (C) provided with a ratchet or pawl (D) to enable the men at the levers (E) to get a fresh purchase. One side of the structure may be boarded up. Pile the hay into the flooring (F). When sufficient hay is piled in, lower the top board onto it. This is made of stout hardwood, with slats beneath to admit of the passage of the wire or hoop iron. Pass the two ropes over it, and heave down on the windlass. When the bale is sufficiently pressed, pass the wires, insert the battens, and make all fast. Slack up on your windlasses and roll out the bale.

MILK POWDER.

JOHN SIMPSON, Rockhampton.—You can obtain full particulars as to manufacture of milk powder from Mr. H. Westring, Swedish Dairy Expert, Post Office, Cairns, Herbert River, North Queensland. Mr. Westring has had a sample sent to him.

CHICORY CULTURE.

PLANTER, Daintree.—The chicory plant is a hardy perennial bearing beautiful blue flowers on a stem often 5 feet high. The young leaves are used as a salad in many parts of Europe; they resemble endive in their bitterness. The seed is sown in drills about 16 inches apart. Before the leaves cover the ground the plants are thinned out, and the spaces between the rows should be well cultivated and kept clear of weeds. The plant has a thick, white, fleshy tap-root, and thrives in any soil which will suit carrots, parsnips, arrowroot, &c. The roots are fit to be dry in from five to six months. The weight of crop runs to about from 3 to 5 tons per acre. There are several varieties of chicory, the best being called the "white loaf"—white leaf—which forms a head much like that of the Cos lettuce. It is also called the "large-rooted Brussels chicory," from its thick, stubby root, and is the most profitable variety to grow for admixture with coffee. The herbage is excellent fodder for cattle and sheep. To prepare the root for sale as commercial chicory, the root is first cut into small pieces, dried in a kiln, and then roasted in revolving iron cylinders. The loss in weight by this process is from 20 to 30 per cent. During the roasting 2 lb. of lard to every cwt. of chicory are added to give it a lustre like that of coffee. The powder looks like ground coffee, and smells like liquorice. There is no more difficulty in growing chicory than in growing any other root crop, such as arrowroot or cassava. We have seen chicory at Cairns dried in the sun, but, of course, it has to be roasted afterwards. There is a good market for the dried or roasted root in this and the southern States.

SAVING SEEDS.

H. F. KENNY, Wynnum Creek.—Wash the seeds; throw away all that float; dry in the shade. The best way to grow asparagus is to propagate it from the roots or crowns. These should not be allowed to dry, but should be planted quite fresh.

SWEET POTATOES NOT SETTING.

G.C.H., Nikenbah.—Mr. C. Ross, manager of Westbrook State Farm, says: In the first place two and a-half months (especially the early months) is too soon to expect tubers. Rich scrub lands, being composed of so much "humus," will cause sweet potatoes to grow more to top than tubers. I have had the same experience in rich, strong open lands, but when planted in somewhat poorer soil I have had good returns.

Mr. Jarrott, manager of the State Farm, Gindie, says:—I am inclined to think that the failure of "S.C.H." potatoes can be attributed to overgrowth caused by over-fertility of the soil or excessive moisture.

It used to be my practice to grow sweet potatoes for market on gravelly soil with a slight mixture of clay in it; and on land of this description we used to get a fair crop of potatoes of excellent quality, but when we required the vines for feed purposes it was customary to plant in the rich scrub soil. Here we would get an enormous quantity of tops, but never a potato, and the ground would be a mass of long stringy roots.

Mr. Quodling, manager of the State Farm, Hermitage, says:—I am somewhat at a loss because information was not given as to manner in which crop had been raised. Apart from the exhaustion of nitrogen, potash, and phosphates by the crops of cane, the vital point appears to be a constitutional defect.

The custom of growing sweet potatoes from cuttings continuously has the effect of decreasing the vitality of plants and yield of tubers.

The practice for securing early crops, by raising shoots from tubers in a hot bed and planting these out instead of cuttings, is likely to give far more satisfactory results.

Mr. J. Mahon, principal of the Queensland Agricultural College, advises "that the vines be cut back and fed to pigs or cattle: hill up the drills afresh and give another two and a-half months. It is too early to expect tubers, unless in the case of some new variety with which I am not acquainted. Of course, I am taking it for granted that the sets were originally planted the usual distance apart."

We have obtained all these opinions from practical men, because we had precisely the same experience which is confirmed by the above writers.

TO DESTROY APHIS AND CABBAGE MOTHS.

P. H. YOUNG, Tambourine Mountain.—We are always pleased to answer any questions which come within the scope of agriculture, but we do not care to repeat the same answer within a month or so. If our correspondent would look up the *October Journal* (1902), page 295, he would there have got his answer as follows:—

Spraying with 2 fluid ounces of black-leaf tobacco to 1 gallon of water is an effectual remedy, Spraying with the resin and soda wash used at the State farms is also very satisfactory. A fine spray must be used, and the application repeated when necessary. Paris green, unless used in conjunction with some adhesive wash such as those mentioned, would not stick on the leaves, and hence would do no good.

We find that dusting with tobacco dust is as good as any other remedy, and we have saved cabbages and cauliflowers by its use not only from aphis and moth, but from the great vaginula slug.

Publication Received.

WRAGGE'S ALMANAC.

We are in receipt of a copy of this very useful publication, which contains a surprising amount of the most varied and valuable information on most subjects interesting to the squatter, the farmer, the merchant, the shipowner, and others. Within its 336 pages will be also found a large number of medical hints for the recognition and treatment of ailments which most commonly affect persons living in localities where medical advice is unobtainable. Meteorology occupies a considerable space in the publication. We fail to understand why the title "Wragge's Almanac" is retained, even in the present issue, since the publishers announce that its compilation is done by their own staff, and that Mr. Wragge wishes to withdraw his name from it. The proposed title for next year's issue—Sapsford's Australian Almanac for Land and Sea—will be much more to the point. Amongst the contributed articles on seafaring, that by the late Captain Meroyu A. Jones deserves especial mention. It is well illustrated by pictures of a 1,000-ton wooden clipper ship in full sail and the fastest transatlantic steamer afloat—the Hamburg-American liner "Deutschland," which crossed the Atlantic in 5 days 7 hours 38 minutes. As a handy almanac for everybody, the book under review is unapproached by more pretentious and expensive publications of the kind.

The Markets.

TOP PRICES FOR FRUIT—ROMA-STREET MARKETS.

Article.	DECEMBER.	
	Top Prices.	
Apples, Eating	13s.	
Apples, Cooking	10s.	
Apples, American, Eating	24s.	
Apples, American, Green	20s.	
Lemons, Italian, per 360	22s. 6d.	
Lemons, Italian, per 180	12s.	
Lemons, American, per 180	12s.	
Lemons, New South Wales	10s.	
Oranges, Italian	10s.	
Oranges, Local	5s.	
Mandarins, Local (indifferent)	5s.	
Apricots, New South Wales, boxes (half-gincase)	6s.	
Apricots, Queensland, half-case	7s.	
Plums, half-gincase	6s.	
Peaches, half-gincase	8s. 9d.	
Nectarines, half-gincase	5s.	
Gooseberries, English	6s.	
Cherries	13s. 6d.	
Passion Fruit, quarter-case	5s.	
Mangoes	9s.	
Pineapples, rough	5s.	
Pineapples, Queen	6s. 6d.	
Melons	15s.	
Rockmelons	5s.	
Bananas, per bunch	1s. 6d.	
Bananas, per dozen	2½d.	

AVERAGE TOP PRICES FOR DECEMBER.

Article.										DECEMBER.		
										Top Prices.		
										£	s.	d.
Bacon	...	...	...	...	...	...	...	lb.	0	1	11½
Bran	...	...	...	...	...	...	...	ton	9	11	3
Butter, First	...	...	...	...	...	...	...	lb.	0	0	11
Butter, Second	...	...	...	...	...	...	...	"	0	0	9½
Chaff, Mixed	...	...	...	...	...	...	...	ton	7	0	0
Chaff, Oaten	...	...	...	...	...	...	...	"	7	5	0
Chaff, Lucerne	...	...	...	...	...	...	...	"	7	10	0
Chaff, Wheaten	...	...	...	...	...	...	...	"	6	8	9
Cheese	...	...	...	...	...	...	...	lb.	0	0	9½
Flour	...	...	...	...	...	...	...	ton	12	0	0
Hay, Oaten	...	...	...	...	...	...	...	"	6	5	0
Hay, Lucerne	...	...	...	...	...	...	...	"	5	10	0
Honey	...	...	...	...	...	...	...	lb.	0	0	21½
Rice, Japan (Duty paid)	...	...	...	...	...	...	...	ton	22	0	0
Maize	...	...	...	...	...	...	...	bush.	0	4	6½
Oats	...	...	...	...	...	...	...	"	0	4	2¾
Pollard	...	...	...	...	...	...	...	ton	10	12	6
Potatoes	...	...	...	...	...	...	...	"	12	15	0
Potatoes, Sweet	...	...	...	...	...	...	...	"	7	16	3
Pumpkins	...	...	...	...	...	...	...	"	8	1	3
Sugar, White	...	...	...	...	...	...	...	"	20	5	0
Sugar, Yellow	...	...	...	...	...	...	...	"	17	0	0
Sugar, Ration	...	...	...	...	...	...	...	"	13	0	0
Wheat	...	...	...	...	...	...	...	bush.	0	6	3½
Onions	...	...	...	...	...	...	...	ewt.	0	6	10½
Hams	...	...	...	...	...	...	...	lb.	0	1	2¼
Eggs	...	...	...	...	...	...	...	doz.	0	1	5½
Fowls	...	...	...	...	...	...	...	pair	0	5	6¾
Geese	...	...	...	...	...	...	...	"	0	8	10½
Ducks, English	...	...	...	...	...	...	...	"	0	5	11¼
Ducks, Muscovy	...	...	...	...	...	...	...	"	0	7	8¼
Turkeys, Hens	...	...	...	...	...	...	...	"	0	13	9
Turkeys, Gobblers	...	...	...	...	...	...	...	"	1	16	6

ENOGGERA SALES.

Article.										DECEMBER.		
										Top Prices.		
										£	s.	d.
Bullocks	...	...	...	...	...	...	...	...	...	25	6	8
Cows	...	...	...	...	...	...	...	...	...	17	13	4
Wethers, Merino	...	...	...	...	...	...	...	...	...	1	2	1
Ewes, Merino	...	...	...	...	...	...	...	...	...	1	0	3
Wethers, C.B.	...	...	...	...	...	...	...	...	...	0	19	0
Ewes, C.B.	...	...	...	...	...	...	...	...	...	1	15	3
Lambs	...	...	...	...	...	...	...	...	...	0	18	3
Baconers	...	...	...	...	...	...	...	...	...
Porkers	...	...	...	...	...	...	...	...	...	2	7	3
Slips	...	...	...	...	...	...	...	...	...	0	15	0

Orchard Notes for February.

By ALBERT H. BENSON.

As this month is usually a more or less wet one, especially in coastal Queensland, the cultivation of the orchard is apt to become somewhat neglected, owing to the inability of working the land; and a heavy crop of weeds of all kinds is the result. If possible, the weeds should be kept down when young by means of one or two horse cultivators fitted with surface-working knives; but if the weather prevents this from being done, no great harm will take place if the weeds are mown down before they go to seed. The trash so obtained should be ploughed in, and will tend to maintain the supply of organic matter in the soil, and this, as has been stated frequently in this *Journal*, is of the greatest importance, as, besides rendering the soil more friable and easier to work, it increases the power of the soil to retain moisture, a most important consideration in a climate as changeable as this. In drier districts the orchard should receive good cultivation after every rain, as by this means the growth of weeds will be prevented and the greatest amount of moisture will be retained in the soil. In dry districts where irrigation is available, all citrus trees should receive a thorough soaking during the month, unless there has been a fall of several inches of rain, as a soaking now will carry the fruit on to maturity, provided that it is followed by cultivation. In irrigating fruit trees, always give a watering, say equal to 4 inches of rain all over the orchard; as this is infinitely better than giving a number of surface waterings. One soaking irrigation saturates every part of the soil, and will last for two or three months if followed up by proper cultivation; but surface waterings dry out in a few days, and unless kept up do more harm than good. In any case, surface waterings induce the growth of surface roots, and unless these surface roots are kept well supplied with moisture they will die off, and more harm than good will be done to the tree. On the other hand, when the land is well saturated, the roots strike down, and are therefore less likely to dry out or be affected by sudden changes. The marketing of fruit still continues an important branch of orchard work. The main crop of rough-leaved pines, besides mangoes and bananas, in the Southern coastal districts, as well as the later varieties of plums and apples in the Stanthorpe district, have to be disposed of. As stated in last month's notes, every care should be taken to place the fruit on the market in as neat and attractive a manner as possible, and to see when packing it that it is free from fruit fly, San José scale, or other disease. I am sorry to say that few growers realise the importance of proper packing, as a large proportion of the locally grown fruit that comes to market is put up in anything but an attractive form. Clean cases, even grading, and neat packing always take the eye of the buyer; and fruit so got up will pay the grower handsomely for the extra trouble he has been put to, and not only that, should the market be glutted, fruit so got up will always find a sale when other fruit marketed in a slovenly manner is unsaleable.

February is a good month for transplanting mangoes and other tropical and subtropical fruit. The ground should be in thorough order, and dull or showery days should be chosen for the work; if this care is taken, there will be little risk or failure. Plant mango seeds either in nursery row for working over next year, or, if seedlings are wanted, then in the position they are to occupy permanently. In selecting mango seeds for trees to stand permanently, choose none but those obtained from the very best fruit—fruit that is of fine flavour, large size, handsome appearance, as free as possible from fibre, as well as being a prolific variety and strong grower.

Budding of both citrus and deciduous trees can be continued during the month, and the nursery will require constant care to keep it free from weeds, to see that all ties are cut, and all buds properly started and tied up; as, unless the young tree is properly started and trained to a single stem in the nursery, the grower has considerable difficulty in getting it to grow into a decent tree when it is permanently planted out in the orchard.

Strawberry planting should commence during the month. The land, which should be a rich loam of moderately heavy texture, if possible, should be well prepared by thorough working to a depth of at least 12 inches. If the land is virgin scrub, no manure will be necessary; but if it has been under crop for some time it should receive either a good dressing of well-rotted farm manure or of a commercial fertiliser rich in phosphoric acid, potash, and nitrogen.

Choose moist, showery weather for planting strawberries, and take care to set out nothing but strong, healthy runners. If the land is dry at time of planting it will require irrigating, and this is best done by opening up a furrow in which the plants are to be set, and filling it with water. As soon as the ground has soaked up the water, set the plants in the furrow and cover them with the dry soil. This method of watering will be found far better than setting the plants in dry ground and watering afterwards; as the moisture is all at the root of the plants, and the dry soil that is placed on the top acts as a mulch and prevents the soil from drying out. Where leaf blight is troublesome—viz., wherever the Marguerite is grown—all plants should have all old diseased leaves removed, and the crowns and young growth should be dipped in Bordeaux mixture, taking care that the Bordeaux mixture is made from the best bluestone and not from an inferior article, as the cheap bluestones contain more or less sulphate of iron, and this will destroy the bulk of the plants dipped into a solution of which it forms a part.

The best strawberries to grow are—

1st, for early box berries—Aurie and Marguerite.

2nd, for mid-season box berries—Aurie, Marguerite, Federator, Pink's Prolific, and Trollope's Victoria.

3rd, for jam—Pink's Prolific, Trollope's Victoria, and Marguerite, though the latter has not the colour of the former.

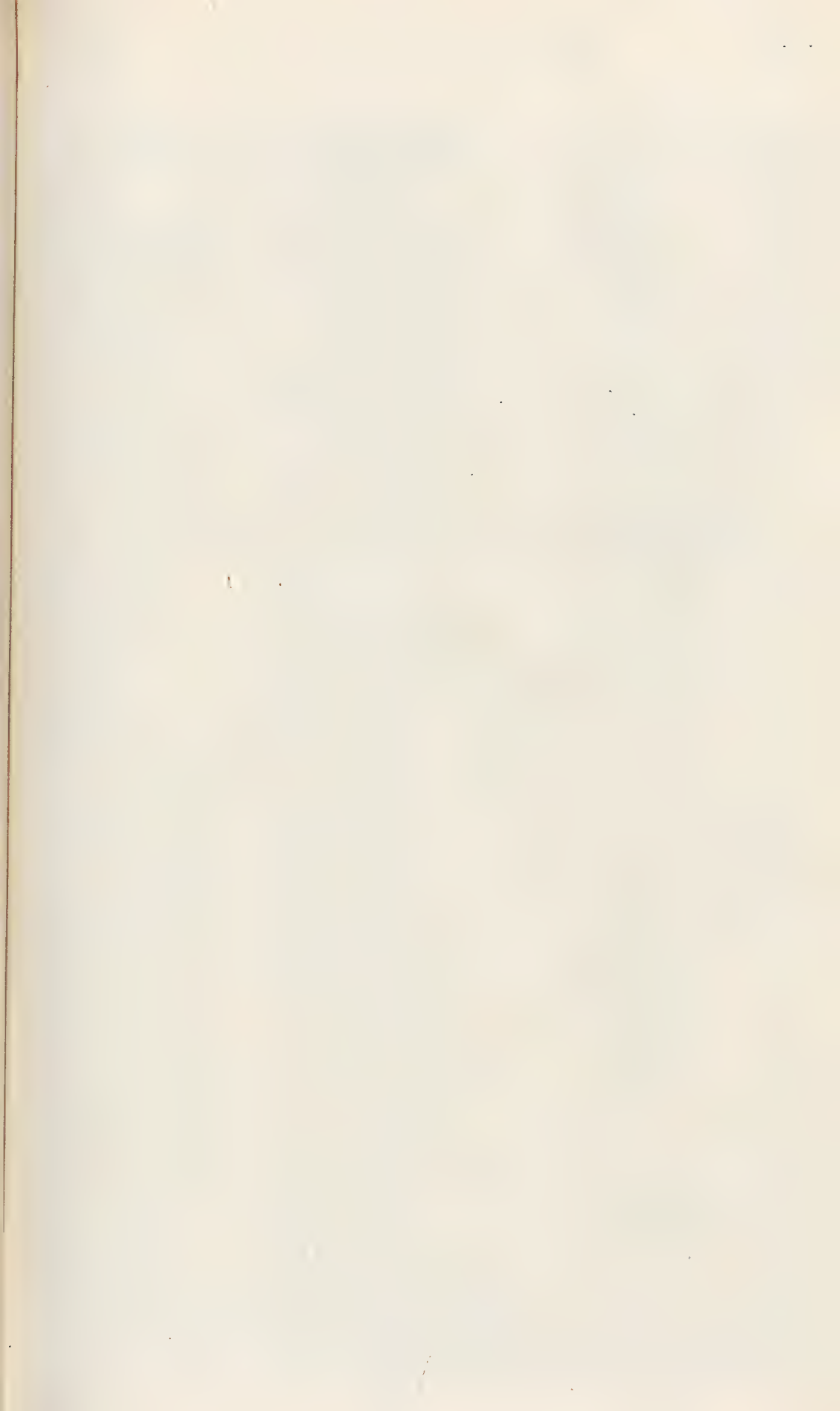
Farm and Garden Notes for March.

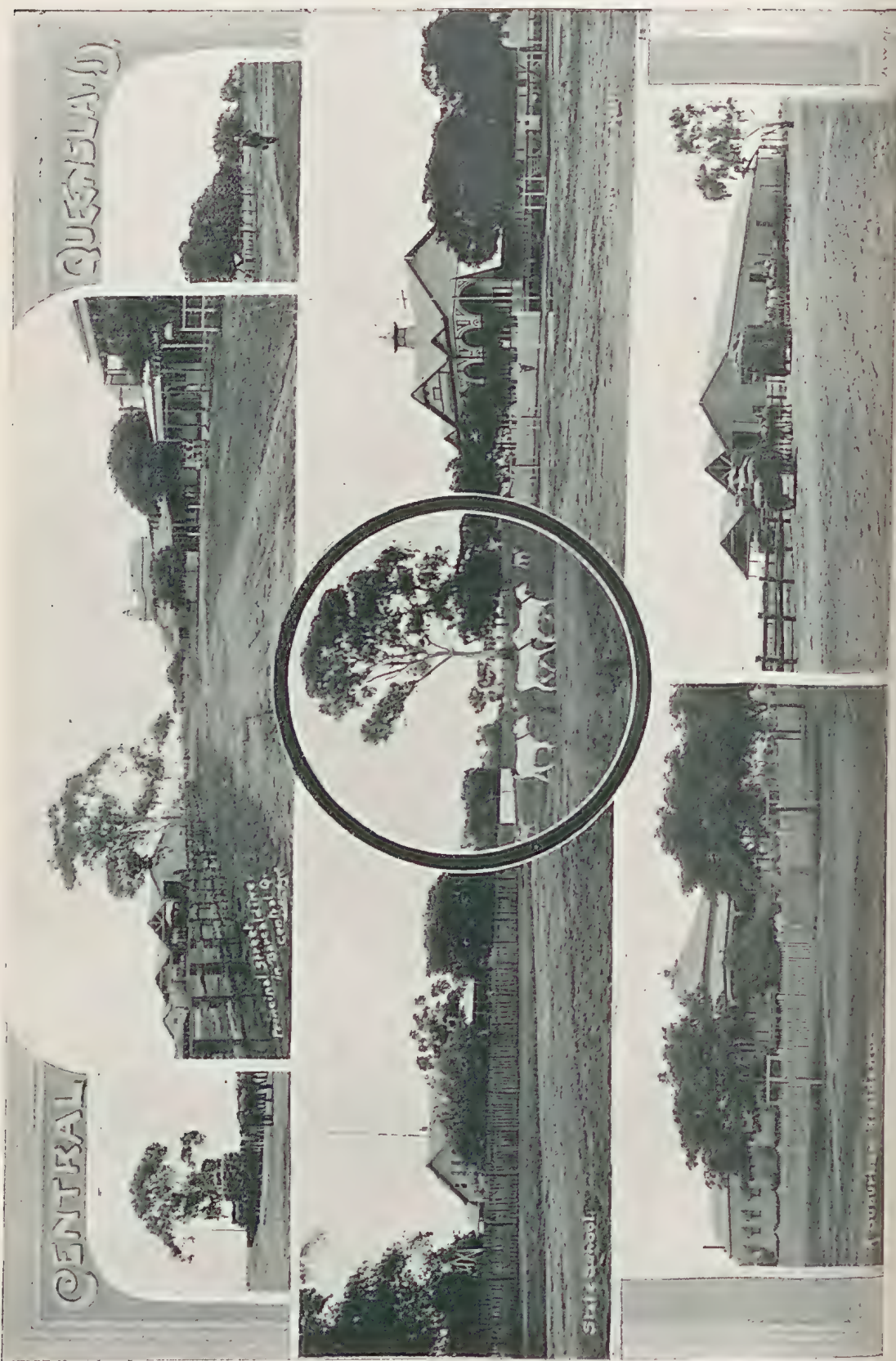
FARM.—Take every opportunity of turning up the ground in readiness for sowing and planting. Get in the main crop of potatoes, and, if possible, get this work finished by the middle of the month. The growth of weeds will now begin to slacken off; therefore, seize this time for sowing lucerne. The land for this crop should have already been prepared by ploughing, cross-ploughing, and, if necessary, subsoiling and harrowing. If the weeds grow much after this, mow them down, then harrow and roll the soil. Sow either broadcast or in drills. If weeds grow before the young plants have got good hold of the ground, mow the field. Before the weeds again make headway, the lucerne will have beaten them. We do not advise sowing maize during this month, the winter being so close at hand, but in late districts, sheltered from frost, a little may be sown. Gather all the ripe corn; cut tobacco, leaving the leaves to wilt on the ground before carting to the curing-shed. Rye grass, prairie grass, oats, barley, wheat, sorghum, vetches, carrots, mangolds, and Swede turnips, also onions, may be sown.

In Northern Queensland plant granadillas for crop; also water-melons, opium, poppy, and buffalo grass; continue planting sweet potatoes, and make early sowings of tobacco. Plant anatto, kola nuts, Jack fruit, cow pea. Trash sugar-cane. Some temperate zone vegetables may be sown, but this is better left for the following month. Plant bananas, egg plants, and coffee. Harvest paddy. Keep the yam patches clean. Get in Kafir corn. Keep all weeds down.

KITCHEN GARDEN.—Summer ends on the 20th of this month, yet weeds may still give trouble. Keep them down by constant hoeing. This will be a very busy month for market gardeners. Get the soil into a fine tilth, and plant out cabbages, cauliflowers, Brussels sprouts, celery. Sow broad beans, peas, turnips (swede and white stone), carrots, parsnips, onions, beet, spinach, and radish. These may all be sown in drills from 2 to 3 feet apart. In transplanting, lift the plants carefully, leaving a ball of earth at the root. In planting cabbages on a slope, make the rows across the hill. Dress asparagus beds with salt. Make fresh sowings of beetroot, cauliflower, cabbage, endive, lettuce, leeks, parsley, and sow herbs of all sorts. Plant potatoes, transplant eschallots. Nearly all European vegetables may safely be sown. If grubs are troublesome, spray with Paris green. Tobacco water is also an excellent destroyer of grubs and slugs. For the great slug (*Vaginula*) tobacco waste and dust from the factories are certain remedies, and, in addition, are good fertilisers.

FLOWER GARDEN.—Now is the time to plant out bulbs. All bulbs like well-drained, somewhat sandy soil, with a plentiful admixture of leaf mould. Manure should be well rotted and incorporated with the soil. Lift gladiolus bulbs when the leaves are quite withered. Replant them at once. During this month all annuals and herbaceous plants it is intended to raise from seed should be sown. In sowing small seeds the surface of the ground must be made as fine as possible. Put in cuttings of shrubs and all herbaceous plants. Get as good a stock of cannas as possible. They require rich ground and plenty of liquid manure. Put in cuttings of carnations in sandy soil. Disbud and stake chrysanthemums, giving them occasional waterings with liquid manure. Thin them out to only a few buds if you want large flowers. Dahlias are now looking well. For climbing plants, sow *Antigonon*, a charming rose-coloured climber; *Asparagus plumosa* in shady spots; *Beaumontia grandiflora*, a splendid white flower, suitable for a fence—will grow 50 feet high; *Bignonia capensis* good for a fence; *Bougainvillea*, three varieties—glabra, spectabilis, and splendens; they are magnificent climbers, and will soon cover the ugliest spots in a garden. *Quisqualis indica* is a pretty climber, with clusters of pink and white flowers. *Wistaria sinensis* is a well-known favourite, with large bunches of lilac or white sweet-smelling flowers.





Agriculture.

FARMING BY IRRIGATION AT BARCADDINE.

By THE EDITOR.



IF the late disastrous drought has carried any lesson with it more than another, it is that, if farming, sugar planting, and grazing are to be successful and to be always depended upon as sources of public and private revenue, irrigation must be invariably adopted, at least wherever practicable. Irrigation is the foundation stone of Queensland's prosperity. This should be generally recognised by all classes of the community, and should not be, as is too often the case, only thought of when dry years succeed each other, and forgotten even after one good year with a plentiful rainfall. Consider what irrigation does for us. It enables us to cultivate to a profit the arid soils of the West. It makes the desert literally to blossom. It makes paying crops a certainty. It multiplies the productiveness and carrying capacity of the land. It renders the farmer perfectly independent

of rainfall. It enables the orchardist and vigneron to produce the choicest fruits to perfection, and even where there is a good rainfall it increases threefold the value of the land in such districts. The speculator and investor need not hesitate to make advances to irrigation farmers. If the dwellers in Australasia alone knew what vast areas of fertile land, what inexhaustible stores of artesian water, what facilities for carriage of produce, and what heavy crops of cereals and fruit are produced in the Central district of Queensland by means of irrigation, the desert and downs country of that part of Queensland would be laid under cultivation from Emerald to Longreach by hardworking home-seekers, by farmers who understand their business and who know that success as certainly succeeds labour in such irrigation areas as night succeeds day.

When the first artesian bore was put down at Barcaldine by the Government some 15 or 16 years ago, the town of Barcaldine was not so important a place as it has now become. Since it was thus demonstrated that vast stores of sweet water were obtainable at comparatively shallow depths in the cretaceous formation, bore after bore has been put down by private individuals until the whole country between Aramac, Blackall, and Barcaldine is riddled with bores averaging 1,000 feet in depth and pouring forth from 500,000 to 600,000 gallons of excellent water clear as crystal every twenty-four hours. The result of this has been that from an arid wilderness these districts have burst into blossom, and a paradise has been created out of what, up to that time when no bore existed, was in appearance but an arid, sandy desert, carrying good grass and saltbush in good seasons, but becoming parched and dried and destitute of herbage in a dry time. And these Central lands are not blessed with a copious, regular rainfall. About 30 inches of rain in the best seasons fall at fitful seasons during the year, and owing to its irregularity farming has been rightly looked upon as "the sport of fools and cranks." But the artesian water has not only made farming possible but highly remunerative. Higher yields of wheat, barley, oats, and maize, citrus fruits, grapes, dates, &c., &c., have been and are being obtained in the once desert country than are being obtained in the South. There is absolute certainty that once the seed is in the ground or the tree planted a rich harvest will follow. No longer does the Central farmer anxiously watch the pitiless heavens for the refreshing showers only vouchsafed at rare intervals—no longer are farming and fruitgrowing looked upon as a fad of visionary enthusiasts.

The farmer goes on his way rejoicing, regardless of rain or drought. He ploughs, he sows, and he reaps, for has he not that priceless boon—the bore water?

Before describing the outside country, I will say something about

THE TOWNSHIP OF BARCADDINE. (Plate XII.)

The general idea conveyed to the mind of the Southern city dweller, and to those of the farmers and graziers on the rich plains of the South or the fertile sugar-cane and coffee lands of the far North, by the term “township” of Central and Western Queensland, 400 miles from the coast, is that of a small iron-walled, iron-roofed public-house, the only dependence of which is a roaring crowd of stockmen, shepherds, shearers, and rouseabouts knocking down their hard-earned cheques in the consumption of what a clergyman once described as “liquid hell fire, and doubly-distilled liquid damnation.” The rest of the township is supposed to consist of a store run by the publican, a blacksmith’s shop, and possibly an iron den occupied as a saddle and harness making establishment. The surroundings—a vast sandy plain occasionally grass clad, but usually a breeding place of dust-storms, sandflies, and fleas. Such is the idea entertained by many at the present day of a Western township.

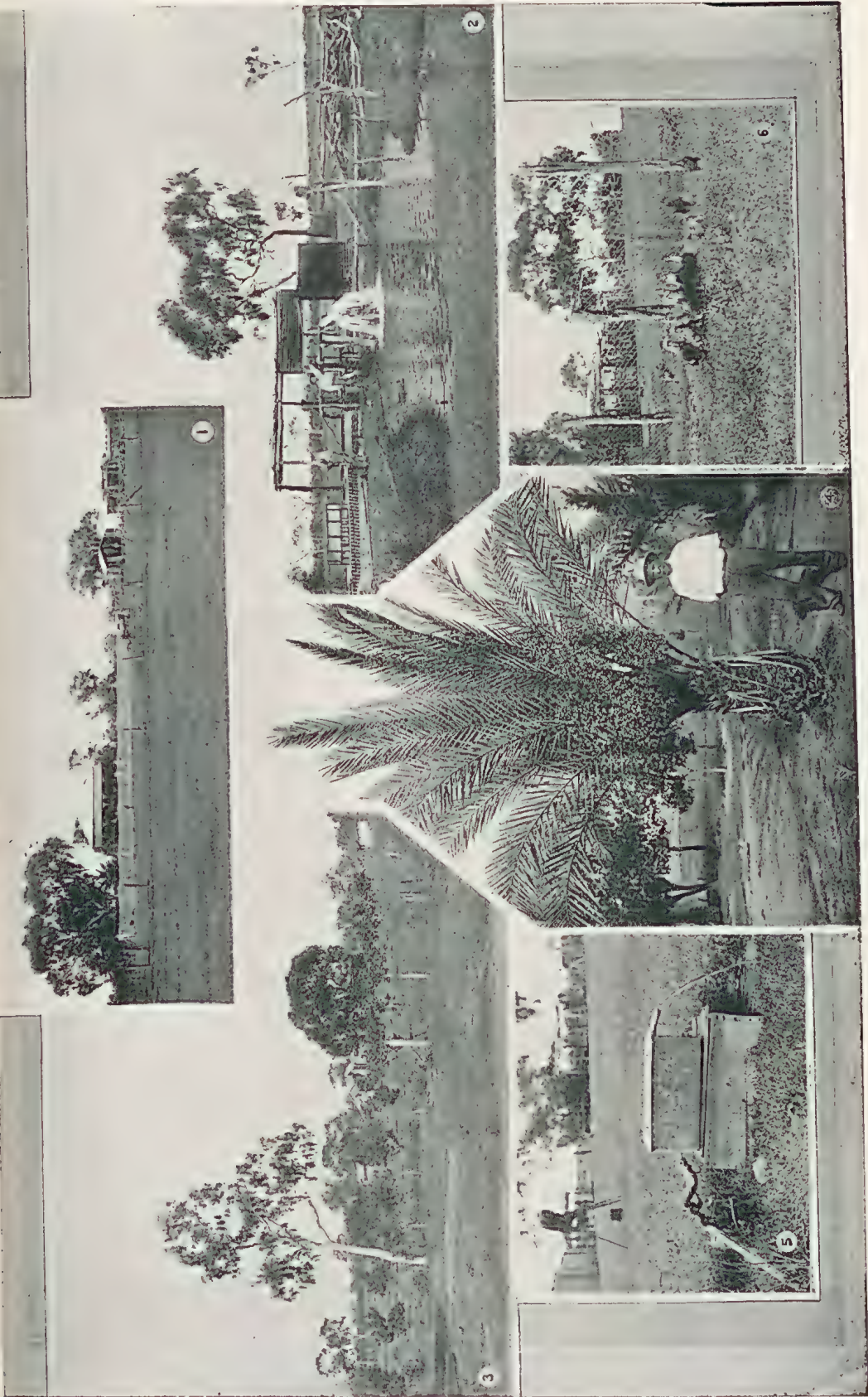
What is the reality? The traveller by train from Rockhampton, if he be only a casual observer, will notice on both sides of the line on his 400-mile ride, long stretches of sandy country timbered with gidyah, boree, dead-finish, and needle-wood, with here and there swamp oak (nearer the coast), bloodwood, and Moreton Bay ash. This is broken by open plains extending to the horizon. His first impulse is to say, “What an arid desert! Is it possible for man or beast to live in such country?” But if heavy rain should have occurred, then the same country is covered with rich grass, and the traveller forthwith changes the burden of his song, and does not wonder that the West produces such vast quantities of wool, exports so much frozen beef and mutton.

When the train at last pulls up at Barcaldine, he is astonished to find that his ideal bush township is, in reality, a town with wide streets, wide footpaths, cemented watertables, lined with beautiful trees, and every street, not one in name, but actually all built upon. Then he will see hotels, public buildings, a fine State school, and private villa residences little inferior to some of those of the large suburbs of Brisbane, Sydney, and Melbourne. The bore water, at a temperature of 102 degrees Fahr., is carried to every house and through every street. Hot and cold baths are an institution at every residence. Beautiful gardens, stocked with choice flowers, orange and lemon trees; grape vines and beautiful creepers climb round the porches and eaves of the houses. The said traveller has arrived here at the end of the most terrible drought that ever afflicted Queensland, yet what signs are there of it? None. The 2,000 people who inhabit Barcaldine have created a little paradise for themselves, and have no need for the rain. Only outside on the large sheep and cattle stations is rain a necessity, because, although the various bores have created miles of clear running streams, yet these cannot affect thousands of square miles of country; and, as stock cannot live on water alone, the consequences to the squatters have been most disastrous. But it is of the grazing farmers around the town that I propose to write, to show to what extent they may be instrumental in preventing much of the loss in stock sustained by the large squatters, who at enormous expense have either imported fodder for their starving sheep, or have trucked them to the coast, wherever grass could be obtained, on agistment.

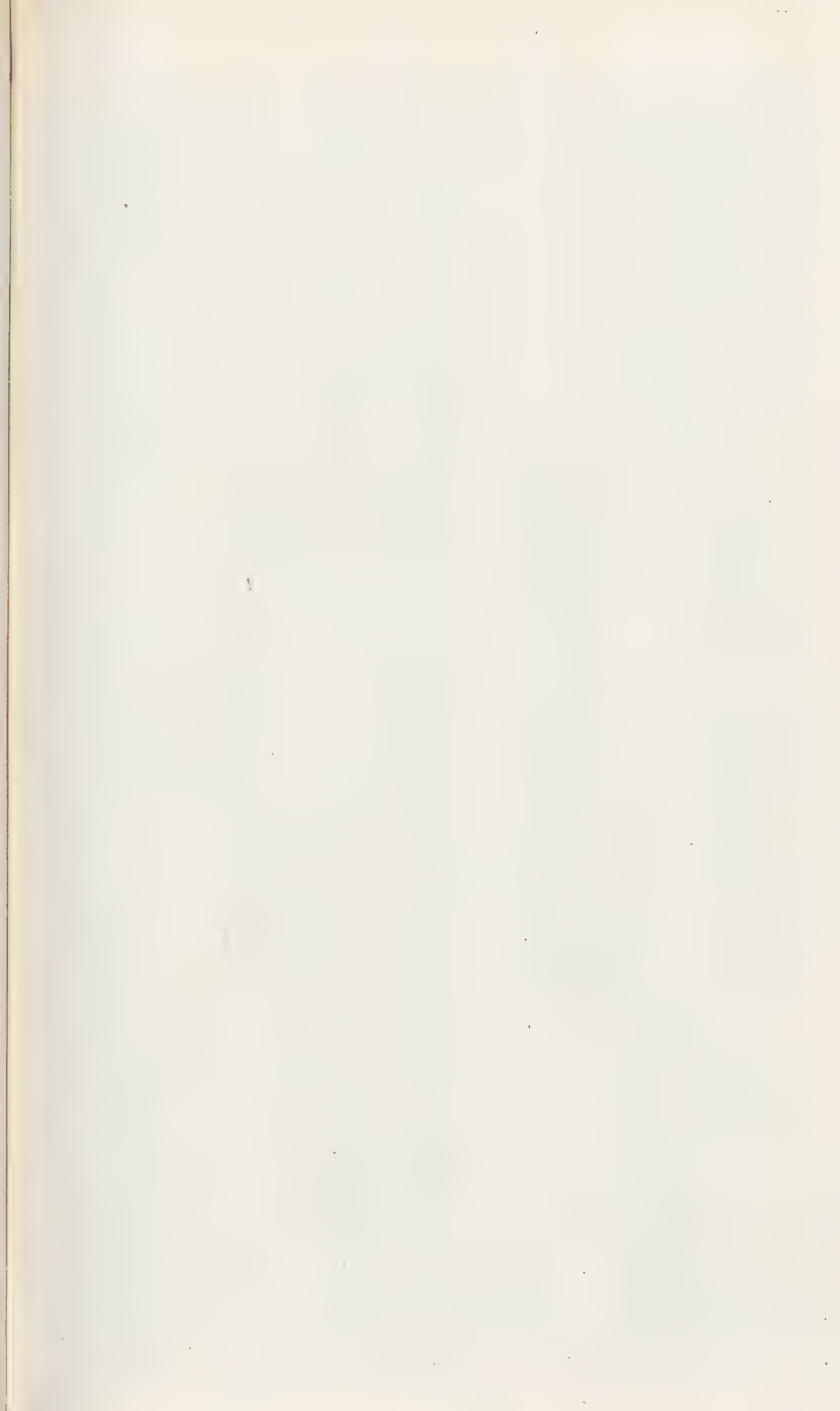
Typical amongst the many farms cultivated by the grazing farmers is that of

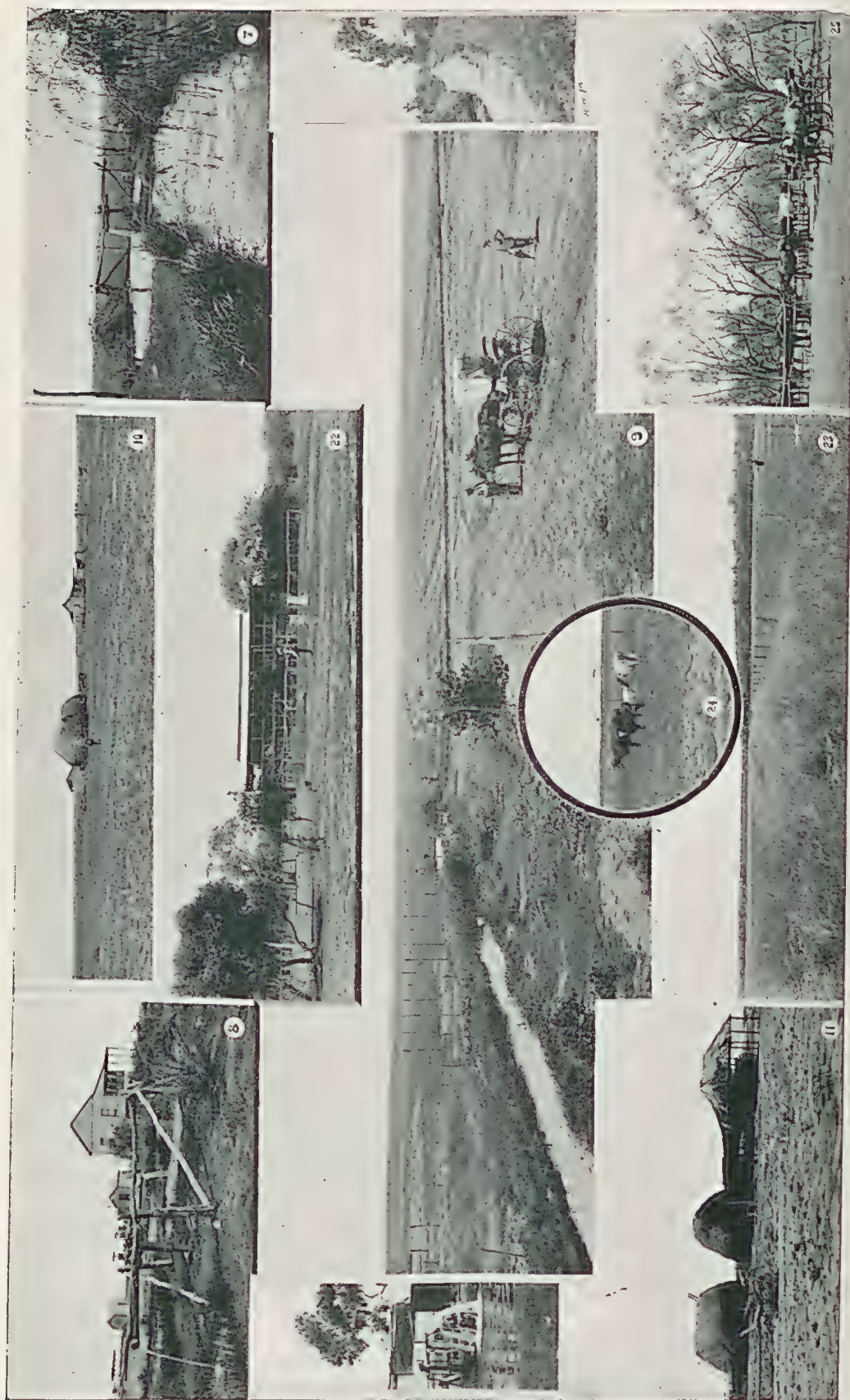
MR. CRONIN,

distant only $1\frac{1}{2}$ miles from the town, and located on the desert country. (Plate XIII.) By the courtesy of Mr. H. H. C. Peut, who is called the “father of Barcaldine,” and justly so, who supplied us with horses and buggy, we were enabled under his guidance to see a great deal of the cultivated country, and to glean many interesting particulars. The “we” includes Mr. H. W. Mobsby,



MR. CRONIN'S FARM.





artist to the Department of Agriculture, who took a large number of excellent photographs, several of which are here reproduced.

On reaching Mr. Cronin's farm there was no appearance of any desert—nothing but a vast expanse of densely-growing rich couch-grass. (Fig. 1.) There are here 250 acres under cultivation. Last year during the height of the drought splendid crops of wheat, barley, oats, and maize were grown. The wheat yielded 40 bushels per acre, and the oats about 2 to 2½ tons of beautifully fine hay per acre. When the grain crops are taken off, there follows a fine sward of couch-grass. So luxuriously does this grow that from 10 to 12 sheep can be fattened on every acre during the season. During the long drought Mr. Cronin kept all his stock alive and sold hay and other fodder to his neighbours. He started here 10 years ago. Being a merchant, he knew nothing of farming or stock, scarcely knew the mouldboard of a plough from the tailboard of a dray, but he went at it with a will, worked early and late, cleared his land, and now is a thoroughly independent man, with a beautiful and productive property on the desert country, besides owning other lands in other parts of the district, with quantities of stock and machinery. He has also a woolscouring business, which, together with the farming business, is carried on by the agency of bore water. The bore, having been put down in the days when well borers were scarce and were coining money, cost him £1,000. (Fig. 2.) The depth is 1,000 feet, 450 feet being cased. The water, which has a temperature of 112 degrees Fahr., gushes out at the rate of 500,000 gallons in 24 hours, and is carried to the fields by means of trenches, and distributed by lateral drains. There is a very healthy-looking orchard of citrus fruits, oranges, lemons, citrons, and comquats. The trees at the time of our visit were full of fruit, and there was no sign of either dieback or scale. (Fig. 3.) Stone fruit will not succeed in the district, as the white ants attack the trees as soon as they begin to bear. We noticed some cassava growing, but nothing is done with it, Mr. Cronin preferring to work the farm crops to troubling himself about orchard or fancy crops. The hayshed is a fine structure, 100 feet long, 30 feet wide, and 12 feet high. The hay press is home-made, and is very effective in turning out 2-cwt. bales. Date-trees here, as elsewhere in the district, bear heavily at seven years' growth. Mr. Cronin's trees, which have received no attention, are laden with fruit of excellent quality. (Fig. 4.) Although large quantities of good fruit are produced, none is exported to the South.

A very singular use is here made of the warm bore water. All the ducks and fowls on the farm are reared by means of an incubator heated by the warm water passing through it. The incubator is a simple contrivance of two zinc-lined boxes. (Fig. 5.) In one, the eggs are placed in trays, and the water, always at even temperature, passes through the outer box. The results (Fig. 6) are so satisfactory that failures rarely occur. Having partaken of Mrs. Cronin's hospitality, we returned to Barcaldine.

It should have been stated that prior to visiting Mr. Cronin, Mr. Peut drove us to Mr. Arthur's property, "Look Out." Here very good results in the way of wheat and barley culture had been obtained by means of bore water, which is carried for long distances throughout the property. (Plate XIV., Figs. 7, 8, 9.) As Mr. Arthur was, however, about to relinquish his lease, there was no cultivation in progress. This property is on the downs or blacksoil country. (Fig. 9.)

MR. R. WALKER'S FARM

is about 3 miles from Barcaldine. His paddocks are a fine sight, being well grassed with Mitchell and other grasses. Last season he grew a large crop of barley for green fodder and hay, and mowed it six times in succession, which fact will give some idea of the richness of the soil. Subsequently a crop of splendid grass covered the field. The whole of this cultivation is irrigated. Some of the land—about 2,000 acres—is on low country liable to be flooded during heavy rain. Not far from this is a property of 640 acres belonging to

Mrs. Shakespere, of the Shakespere Hotel, Barcaldine. The whole of this was a waving field of Mitchell grass when we saw it. Mr. Peut showed us a 1,280-acre paddock of his own with a bore on it. This was also heavily cropped with Mitchell grass. From this point one could see 20,000 acres of grass country with scarcely a tree on it, divided into five blocks, only 2 miles from Barcaldine. The first supply of water here is obtained at 500 feet, the second at 1,000, and below that the water-bearing strata will yield 1,000,000 gallons daily.

MR. G. SHAVE, WOODEND FARM,

is an experienced farmer, having been brought up to it, and stuck to it all his life. He has located his farm on the black soil, where he rents 540 acres, and considers himself well off in having only £100 a year to pay in rent. Without the bore, the land would be valueless. With it, he can raise heavy crops, quite irrespective of rainfall.

The soil is a dark loam, 2 feet 6 inches deep, lying on a loamy clay subsoil. (Fig. 10.)

At present he only cultivates 40 acres, the rest of the farm having a fine growth of Mitchell grass. His wheat and barley yielded a return last season of from 16 to 20 bushels of grain per acre. Two fairly large stacks of oaten hay still remained untouched. (Fig. 11.) Oats give a large yield on this soil. From 2 tons to 2½ tons of hay per acre is the usual return.

The bore is 1,400 feet deep and yields 600,000 gallons per hour running full and strong. If sunk a little deeper the flow would reach 1,000,000 gallons.

Near this farm is a magnificent paddock of 1,280 acres covered with a dense growth of splendid Mitchell grass. This paddock belongs to Mr. H. H. C. Peut, and Mr. Shave said that if he had that paddock and its bore he would consider his fortune made. So great is the faith that practical and experienced men have in the capabilities of the black soil and in the future of agriculture in this district.

MR. HANNAY'S FARM, HAMLET DOWNS,

is in the desert country at Geera, 12 miles from the town. On our arrival at Geera Railway Station we found a carriage awaiting us to convey our luggage to the house, distant half-a-mile. The carriage is here depicted. (Plate XV., Fig. 12.) It is the sole property of Mr. Hannay's young children, who broke in a five months' old foal to draw it. The work done by that infant prodigy of horseflesh was astonishing. It trotted away with all our baggage and the two drivers as easily as a two-year-old. Subsequently we saw a huge pile of cord-wood ready for the engine of a bore plant, all drawn in by this marvellous animal.

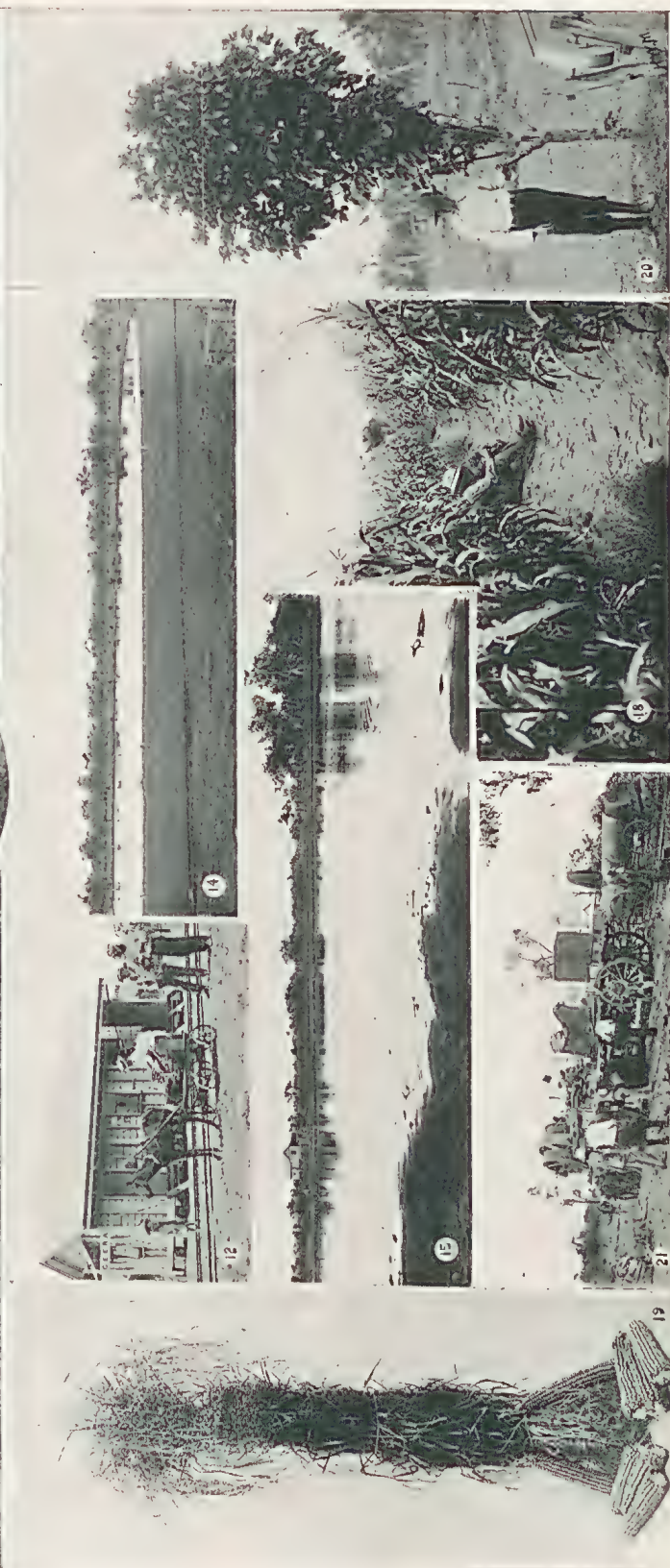
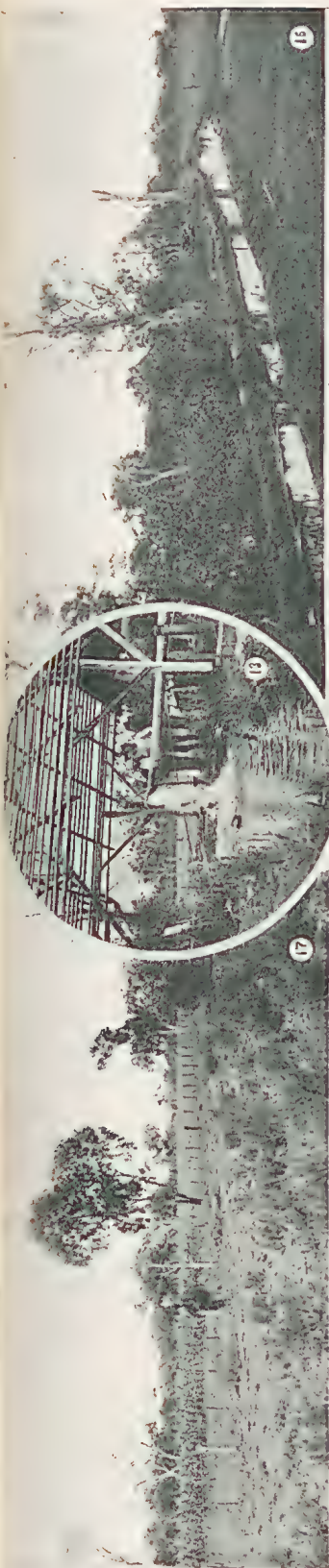
Mr. Hannay farms 13,000 acres as a grazing area, and last year cultivated 100 acres. This year he will have 300 acres under the plough. With the present bore flowing at the rate of 500,000 gallons per day, he can irrigate 130 acres.

The present bore is 1,060 feet deep, and the temperature of the water about 100 degrees Fahr. The surface of the soil for a radius of 50 yards from the bore-hole has sunk about 2 feet, indicating probably some subsidence far below, but the flow from the pipe is not interrupted. (Fig. 13.)

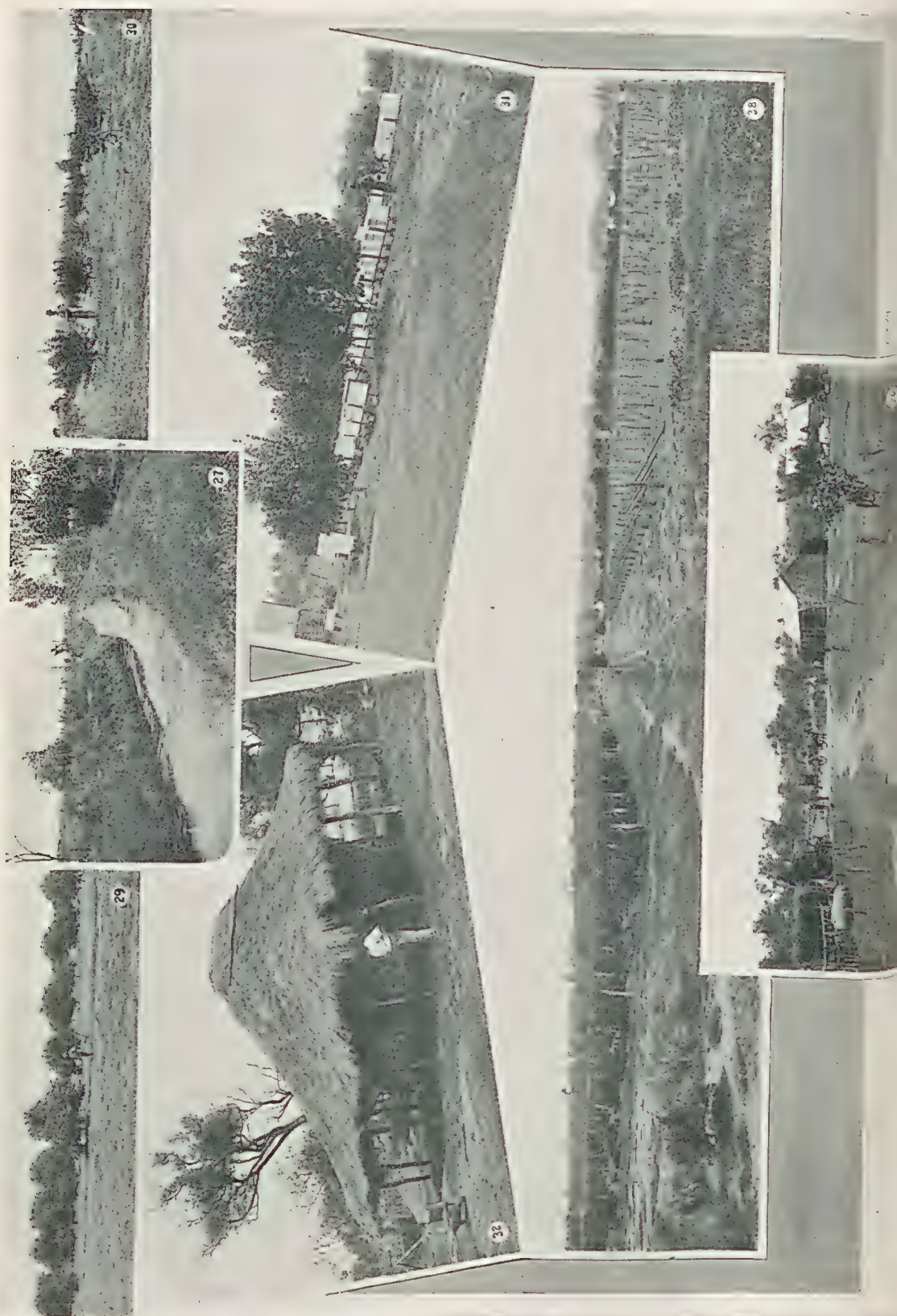
None of the bores are now ever shut down, it having been found better to let them flow night and day. When shut down, the water forces its way between the outside of the casing and the adjacent soil, causing derangement of the perpendicularity of the bore and a reduced flow.

Although the land is practically level for miles round, there are certain large basin-like depressions on the country near the homestead. Mr. Hannay conceived the idea of filling these from the bore. The result has been that several fine lakes have been formed. (Figs. 14, 15.) That in front of the house, covers 40 acres, and is 12 feet deep. Another, behind the house, has an area of 24 acres, with a like depth; and about 1½ miles away are several others of considerable area, also of a depth of about 12 feet.

These lakes are covered with wild fowl, which afford good sport to visitors. At one time there were fine fish in them over a foot in length, but Mr. Hannay, thinking the lakes made the climate too moist, decided to empty them.



VIEWS AT GEERA.



THE ALICE RIVER SETTLEMENT.

The result, of course, was that the fish died. The lakes are now partially filled, and add greatly to the beauty of the landscape. The owner is an enthusiastic farmer, as well as an engineer. His crops last year brought in good returns. Wheat yielded 20 bushels per acre; barley the same; 2 tons, and on some parts $2\frac{1}{2}$ tons per acre of oaten hay of fine quality were saved.

For 14 acres of wheat, cut with the reaper and binder, he received £140 as it lay on the field. Then the stubble land fed 800 sheep for three weeks. He shorn 300 sheep for £65-worth of wool, and sold twenty-five of them for £54. £25 per month was paid to him for 20 acres of irrigated couch-grass for fattening purposes. For 4 acres of barley £40 was given, mainly to allow the buyer to get at the couch-grass in the stubble. The barn, 170 feet long by 25 feet wide, was last season packed to the ridge with bags of chaff, all of which brought large prices during the drought.

The bore water is carried all over the cultivation ground by ditches running for some 6 or 7 miles, the main ditch being 6 feet wide and carrying 18 inches of water. (Fig. 16.) All sorts of improvements are going on, and the plough is busily at work getting the ground ready for planting as soon as the time comes. The soil is a reddish, sandy loam with a subsoil of the same texture, perhaps a little stiffer. There are two fields of maize not far from the bore covering about 16 acres. Both are from Argentine seed. One field is ready for pulling, and, as will be seen by the illustration (Figs. 17, 18), has cobbled very well. The yield was expected to reach about 40 bushels per acre. The second field is well-grown, but the grain is still in the milk stage. The average yield per acre will be about the same.

The grass is growing everywhere most luxuriantly. In one paddock we measured it, and found it to be 4 feet $8\frac{1}{2}$ inches high. (Fig. 19.) This is a kind of native *Paspalum*, and it makes excellent feed for stock. Several kinds of new grasses have sprung up since the last rains, all of them good fodder grasses. Mr. Hannay's brother owns a grazing farm close by, and he has built a fine house on it, and intends to go in largely for farming. During our visit, the flies were a perfect plague to man and beast. One day, at dinner, they were such a pest that the table had to be carried into the open air before the meal could proceed in anything like comfort. There is telephonic communication with Barcaldine, the current being carried along the fencing wires. Mr. Hannay has a great opinion of agricultural motors, and proposes, as soon as he has more information about them, to substitute a motor for horses. There seems to be little doubt that the motor will eventually supersede horses for farmwork in many parts of the world. The motor can be made to do many kinds of work for which horses are now used, and other kinds for which horses are unsuitable.

It should have been mentioned that amongst the crops which would thrive to perfection in the desert country is cotton. At the rear of Mr. Hannay's house are four Sea Island cotton bushes, or rather trees, for they have been trained to look at a distance like poplar-trees. (Fig. 20.) They were eaten down to the stem a little while ago by horses, but in less than three months they shot out branches, and produced a profusion of pods. The lint is very fine and long, and should be worth from 8d. to 1s. per lb. in the home market. Neither drought nor frost have affected the plants, which are about four years old. Melons and pumpkins grow to a large size on the irrigated land. In fact, it would appear that the soil under irrigation is capable of producing anything in the agricultural line, as well as citrus and small fruits. On the day we left several wagons arrived with a boring plant (Fig. 21), with which Mr. Hannay intends at once to put down three more bores, from which to irrigate the 300 acres now being got ready for sowing in March. From this thriving farm we were driven by Mr. Hannay to

MR. W. H. CAMPBELL'S FARM, JACCONDOL.

Crossing the railway line at Geera the desert country is left behind and the downs, or black-soil country, is entered upon. This is considerably timbered with

gidyah, boree, &c., of no great size, however. The low-lying land would be very sticky in wet weather; indeed, we were told that after one or two showers of rain it is impossible to get along in a wheeled vehicle. Just before reaching the house (Plate XIV., Fig. 22) a great expanse of bulrushes is seen near the bore, giving a very bright appearance to the landscape, but otherwise the rushes are all but valueless for stock-feeding. There was a quantity of saltbush growing all over the black-soil country, and grass was in evidence everywhere. We were most hospitably received by Mr. and Mrs. Campbell, and the former took us all over his cultivation paddocks, which were knee-deep in succulent grasses. Mr. Campbell is among those fortunate grazing farmers who suffered no losses of sheep during the drought. A flock of 8,000 ewes and 150 rams came safely through the ordeal, and last year 1,150 lambs were marked. Of 72 horses only 15 were lost, mainly owing to the carelessness of those in charge. (Fig. 25.) We were, unfortunately, too late to see the luxuriant crops which had been growing on this land, which had not had a drop of rain since the seed was sown. Wheat, oats, barley, and maize stood in waving fields, standing out like oases in the midst of the barren wilderness created by the drought. These abundant harvests were due solely to the application of bore water. There was still some maize and planter's friend growing, but it had only been intended for fodder, and as there was abundance of succulent grass the horses and cattle scarcely touched it. (Figs. 23, 24.) The water is carried in ditches from the bore to the cultivated fields, and also flows over in an opposite direction into the uncleared land. In conversation with Mr. Campbell, the question arose as to whether the quantity of water flowing from the bore could be doubled or trebled in quantity by the use of a pump. Mr. Campbell and Mr. Hannay were of opinion that it was possible thus to increase the flow. This is a question of hydrostatics which I submitted to a competent authority on irrigation—the manager of the Deep Well Boring Company, in Brisbane, who figured the question out, basing his calculations on the flow of 500,000 gallons per diem and a pressure of 70 lb. per square inch. He concluded that it was not likely that a pump would have so great an effect in increasing the flow.

Another question which is much debated in the district is the comparative value of the so-called desert soil, and the black soil. Some maintain that the black soil is quite unsuitable for agriculture owing to its liability to cake after rain or irrigation. They say also that it cracks so greatly during the summer that it would take oceans of water to irrigate it. Others, and I certainly hold them to be right, state that the black soil is in every way suited to agriculture, provided it is properly worked and judiciously irrigated. When a first irrigation has been done, and the ground then ploughed up and reduced to a fine tilth, the seed is sown, whether of wheat, barley, oats, or rye. Owing to the moisture in the soil, it rapidly germinates, and covers the ground, thus shading the soil, and giving it no time to cake. When the wheat is 6 or 8 inches high it receives a second flooding, and now is left to grow until the flowering time when it gets the last watering before harvest. All this time the land has retained moisture, and that, together with the shade afforded by the crop, have prevented either caking or cracking. In the case of maize or potatoes, cultivation can be carried on for some time between the rows until the crop covers the ground. It is then occasionally irrigated by means of furrows leading from the main ditches at about every row of corn. So that here again cracking and caking are avoided. I am confident from personal observation that this is a correct view to take of the matter. I noticed on land not irrigated—I allude to the black soil—that large cracks appeared here and there, but where irrigation had been resorted to, no cracks were visible. It is the farmers' own fault if caking and cracking are allowed. Consider the Darling Downs black soil. There huge cracks occur in uncultivated paddocks, but none are found on the fields devoted to crop raising even where no irrigation is available.

Other questions of vital importance to agriculturists and others in the Western districts were discussed; but I will leave their discussion to the close of this paper. Having spent a day and a-half at Jaccondol, we were driven

back to Barcaldine, about 12 miles, by Mr. Campbell, going by the way of Cedar Plains, where we halted for a while to look over a very fine area of 640 acres reserved some years ago by the Department of Agriculture for the purposes of an experiment farm. One or two selectors are anxious that this spot should be substituted for the Gindie State Farm. Others say, there is nothing to experiment on. They have grown everything that can possibly be grown under arid conditions and under irrigation. Why should we ask the Government to spend money on doing what we have already done. We can be helped in a much better manner than that, and in quite a different direction.

I will not here enter into the question of concessions to farmers, as that comes within the region of politics which this *Journal* does not discuss.

One farmer spoke about growing lucerne on the black soil. I doubt if lucerne would be a success either there or on the red soil of the desert. The former has too stiff a subsoil, and the latter is so porous that a much greater water supply would be required to treat lucerne as it should be treated—viz., flooded after every cutting. Lucerne will consume one-fifth of an inch of water daily, or between 4,000 and 5,000 gallons a day. To supply this quantity larger quantities of water would require to be poured on to the land than the plants consume, owing to the loss by percolation in reaching the fields and to soakage on arrival. Further, the climate strikes me as being too dry for this particular crop. Still it is worth a trial—*experientia docet*. An ounce of experience is worth a hundredweight of theory.

FAIRVIEW FARM.

This is the property of Mr. Kirby, and was formerly known as the Hit-or-Miss Farm. This gentleman has decided to go in for pig-breeding. He has so far been very successful in this line of business, but hitherto has not obtained any first-class boars or breeding sows. This year he intends to introduce good breeds, and proposes eventually to establish a bacon factory on the lines of the Messrs. Hutton of Zillmere. He is fully impressed with the possibilities of general agriculture in the district, and like many others will put a large area under cultivation this season. His dates are perfect marvels for size and flavour. There is no doubt that the whole country from Emerald to Longreach is eminently suited for date-growing, and seeing that the trees bear heavily at six or seven years old there is no reason why date-growing should not be largely entered upon by young farmers who could in that time supply all the requirements of the State or even of the Commonwealth with dates as good as the famous fruit of Tafile.

THE ALICE RIVER SETTLEMENT (Plate XVI., Fig. 26), called by the present settlers the "Famous" Settlement, was established in 1891 after the shearers' strike. In that year a number of men determined to form a co-operative settlement on the Alice River, 4 miles from Barcaldine, on the desert country. Seventy-two men and one woman agreed to join in the venture. They were met in a most liberal spirit by the then Government of the day, which granted them 3,500 acres of land under an occupation license. The residents of the whole district, and those dwelling between Rockhampton and Longreach, came forward and supplied them with everything that could possibly be required to start a farm. Some gave cattle, some drays, horses, and harness, others dairy utensils and farm implements, building materials, and fencing wire. Rockhampton merchants subscribed cash and goods. The soldiers in camp at the time collected something like £50 for them, and so the settlement started on the banks of the Alice River with every prospect of ultimate success. They set to work manfully to clear a portion of their land, and get in crops, fruit trees, and grape vines. Finding that the rainfall was insufficient, they decided on putting down a bore. (Fig. 27.) For this purpose they borrowed £900, and so successful were they in their operations that they paid off the principal and interest in less than two years.

Notwithstanding the almost certainty of carrying on a paying business, dissension arose amongst them, and gradually their numbers diminished until only eight single men remained. There is no woman at the settlement. These eight stuck to the work, and are now considered as the most independent men in the district. One died a few months ago. The seven who remained shall have their names here recorded. They are: Thomas Evans (secretary *pro tem.*), Alfred Atthews, James Harrison, Charles Fakeley, Frank Campbell, Benjamin Quantrill, and John Plunkett. The deceased shareholder was named Thos. McKervery. Occasionally some of their old mates go to see them, generally "humping bluey." These settlers now consider themselves, as they say, "a cut above their visitors." They make more than a comfortable living. They are out of debt, all bills being regularly paid at the end of the month. Everything is held in common, therefore the land is not subdivided. The last to remain on the settlement inherit the fixtures and stock. I believe, however, that it is competent for a shareholder to transfer his share in the crops by will or otherwise.

HOW IT IS DONE.

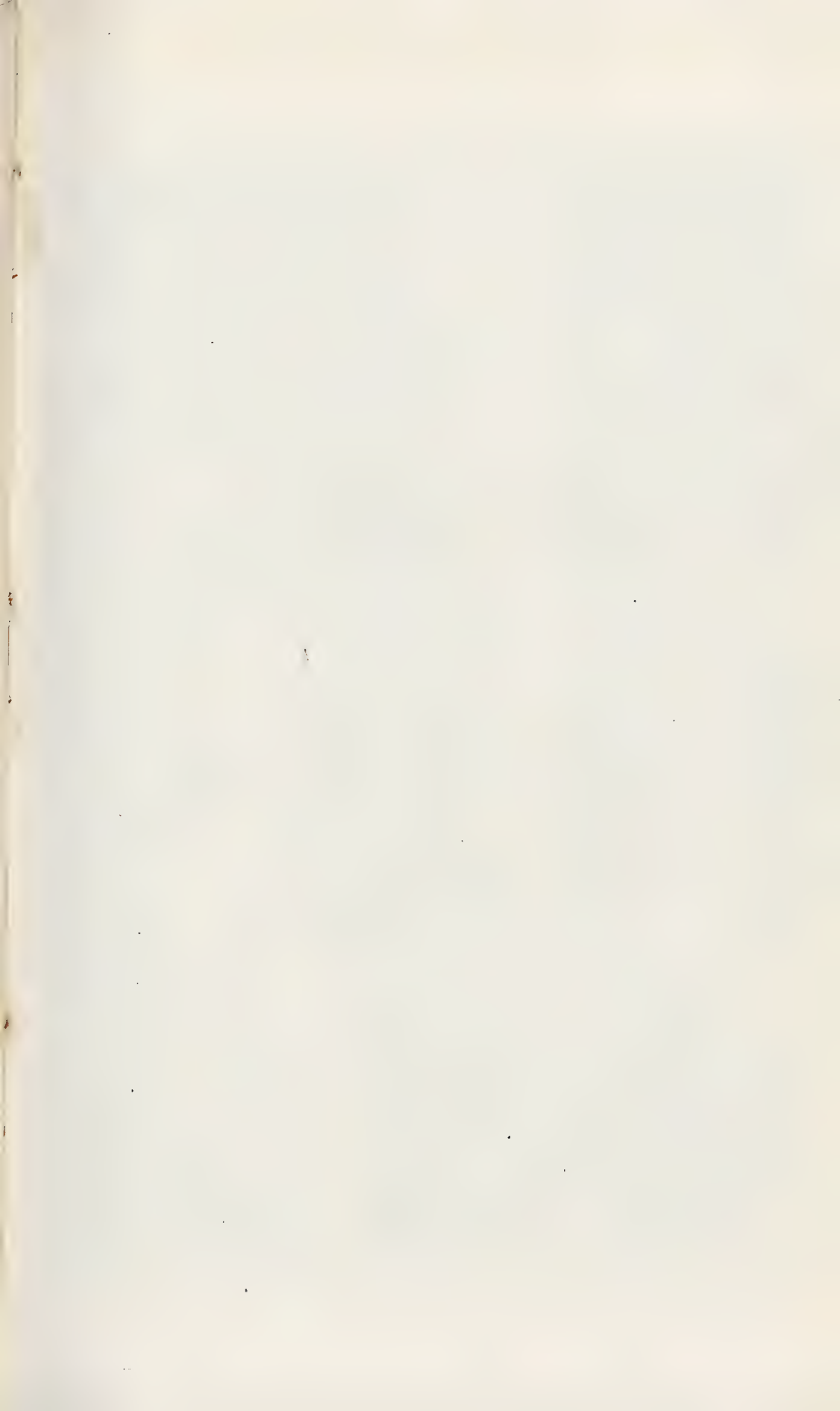
The soil is of the typical desert character, but is not of the best. There (Fig. 28) is a vineyard of $6\frac{1}{4}$ acres in full bearing, from which the year before last 3 tons of grapes were sold at 6d. per lb. Last season the yield was not so good. This is set down to the attacks of white ants. But where the white ants have not attacked the vines, several have rotted at the roots. Mr. E. H. Rainford told me that he expected this result, and had warned the men not to over-irrigate the vines, or the roots would rot. A new vineyard of $2\frac{1}{2}$ acres in extent has been planted.

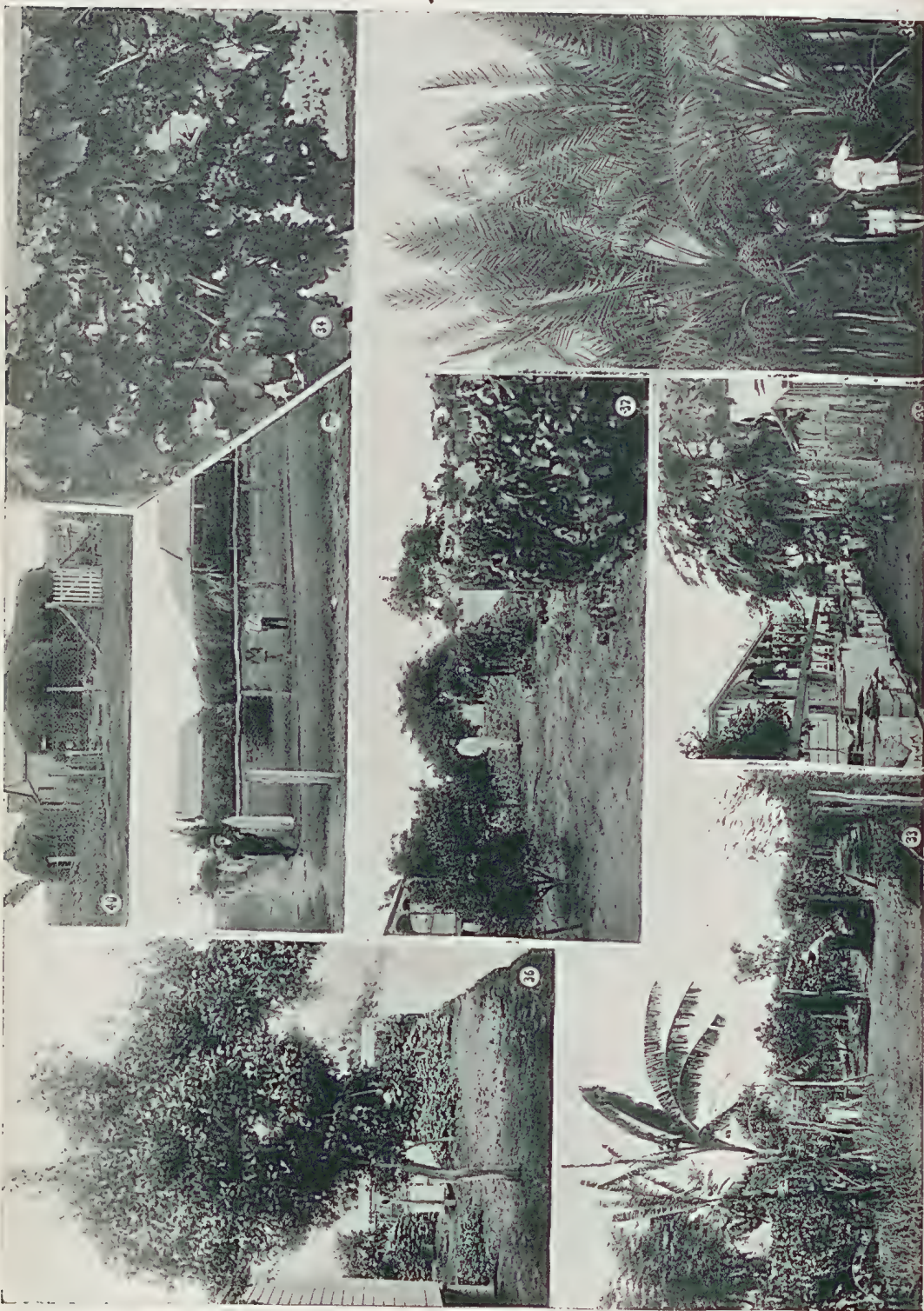
(Fig. 29.) There are 5 acres of orchard, principally oranges and lemons, with some fig, mulberry, and peach trees. The three former succeeded admirably, all the trees being loaded with fine fruit. As for the figs, I have not seen finer fruit anywhere in Australia. Peaches and stone fruit generally are not a success. The white ants attack them when they are at the bearing age, and utterly destroy them. Still, the settlers have planted a small peach orchard in the hope that they may find a means of circumventing the ants. (Fig. 30.) In this issue of the *Journal* Mr. A. H. Benson gives a couple of recipes, which he thinks will overcome the difficulty. If this should prove successful, then stone fruits will be grown as well in this district as in the South.

The agricultural farm comprises 40 acres, and the crops raised are wheat, barley, oats, maize, cow peas, pumpkins, melons, sweet potatoes, &c.

The vegetable garden covers 5 acres, and is a source of considerable revenue to the settlers, as there is ready sale locally and elsewhere for the vegetables, which comprise all the ordinary European varieties. During the drought 16,000 cauliflowers and cabbages were sent to Rockhampton in crates, and realised from 7d. to 1s. 6d. per head.

All the crops are irrigated from the bore, which is 1,333 feet deep, and yields 750,000 gallons of excellent water, having a temperature of 112 degrees Fahr., every twenty-four hours. (Fig. 27.) There are 2 miles of main ditches, whence minor drains are carried wherever water is required. Without this bore, the settlement would have long ago ceased to exist. Manure is much used, and consists mainly of the offal and bones from the boiling-down establishment. Last year, for the sake of the manure, 20,000 sheep in three mobs were confined for a night each on the vegetable garden. The dairy building is seen in Fig. 32. The dairy herd consists of twenty-eight cows, only eight of which were milking at the time of our visit. There are only twenty pigs at present fattening, but last season there were 100. Apiculture is not neglected, there being forty hives. (Fig. 31.) We saw eighteen 60-lb. tins of honey stored ready for sale. The honey brings from 3d. to 4d. per lb. Eight horses are used on the farm, and all their fodder is raised by irrigation. Every day a two-horse cart is sent into the town laden with vegetables, fruit, eggs, honey, &c.





SUBURBAN VIEWS IN BARCALDINE.

We were hospitably invited to dinner, and sat down to a capital repast consisting of corned mutton, boiled cow peas, potatoes, pumpkins, rice, and stewed fruit, accompanied by tea and plenty of good milk. The meal was enlivened by the pious ejaculations of a favourite cockatoo—a very notorious character with a wondrous vocabulary very clearly expressed. The settlers deserve all they make for their pluck in sticking to the place in spite of desertion. They only work eight hours a day, and seem to find that time long enough to do all necessary work.

THE TOWN GARDENS.

As before stated, every house has its garden, small or large, and everywhere are to be seen healthy orange and lemon trees, grape vines, papaw, rock and water melons, vegetables, flowers and creepers. Mr. Harry Grimm's garden is a typical one. (Plate XVII., Fig. 33.) His grape vines were bearing heavily, and the fruit was very large and of excellent flavour. (Fig. 34.) Besides other fruit trees he has a clump of bananas, the only clump I saw in Barcaldine. The climate appears to be too dry for them. Tomatoes and other vegetables grow to perfection. The whole garden is irrigated from the town bore, and Mr. Grimm pays £3 per annum for the use of as much water as he needs.

Mr. Peut has a very lovely garden, full of fruit trees in bearing, vines and vegetables. One of the lemon-trees is shown in Fig. 36. The papaw trees are as fine as any in the Cairns district, and were laden with fruit. One of the male trees was also in full bearing. (Fig. 35.) This is also irrigated from the town bore, as is also a fine garden belonging to Mr. Vance, one of the principal Canadian well-borers located in the town. Here also were very fine grapes and other fruit trees. (Fig. 37.) Dr. Cook, the only medical man in Barcaldine, has a magnificent show of date-trees laden with golden fruit. (Fig. 38.) The garden is a very large one, and being well cared for and regularly watered presents a most pleasing and diversified picture.

All the gardens present pretty well the same features (Figs. 39, 40), so they need not all be described; suffice it to mention those of Mrs. Ogden, Messrs. Bugden, Bunt, and Faulkner, and the well-known Chinese gardeners Jimmy Ah Foo and Ah Yoo, on the Alice River, whose gardens are celebrated for their productiveness.

LONGREACH. (Plate XVIII., Fig. 41.)

We made a hurried trip to Longreach by rail, arriving in the afternoon in time to visit the principal public buildings and points of interest in the town, under the guidance of Mr. Morrison, postmaster, and Messrs. Barlow, Elliott, Taylor, and others of the good-natured and hospitable residents. Longreach is a handsome, well-built town about twice the size of Barcaldine. Its hotels and public buildings would do no discredit to Queen street, Brisbane. The streets are very wide, and the reticulation of the town with water from the bore was nearly completed at the time we were there. Mr. Taylor, the State schoolmaster, has a very capital museum in the schoolroom, filled with geological, metallurgical, and horticultural specimens. There are also products of sea, air, and land, of divers parts of the world. It is a most interesting collection, and Mr. Taylor is rightly enthusiastic as to its value as an adjunct to general teaching. Almost any lesson on ordinary or scientific subjects is illustrated by the actual objects of the lesson under discussion. When a pupil learns that geology is the science of the composition of the strata of the earth, he, as Wackford Squeers said, "goes and knows 'em," but unlike that gentleman's practice, the pupils are not made to know them by breaking stones in the back yard. We were most hospitably entertained at the Longreach Club, and only regretted that our itinerary would not permit of a longer stay. We visited, *inter alia*, the celebrated bore, 3,590 feet deep, whence the water issues at a temperature of 162 degrees Fahr. We observed a man plucking two ducks in a tub by help of the hot water, also boys with goat teams (*see initial*

letter to this article) carrying hot water home in casks, also sundry people washing clothes. What a saving must this hot stream be to householders in firewood!

We did not notice the wealth of trees and vegetation seen in Barcaldine; in fact, we cannot remember seeing any trees at all, or grass or gardens. The bore water, we were told, is responsible for this. It is so highly charged with mineral salts that it is useless for irrigation purposes. The water is taken from the 1,700-foot level, and it is proposed to continue it through the granite in the expectation of finding a flow of water equal to that at Barcaldine.

The country between Barcaldine and Longreach consists mainly of extensive black-soil rolling downs, all suitable for close settlement and agriculture. A view taken at Saltern Creek will give a general idea of the plains. Some 35 miles from Longreach is

THE RAND,

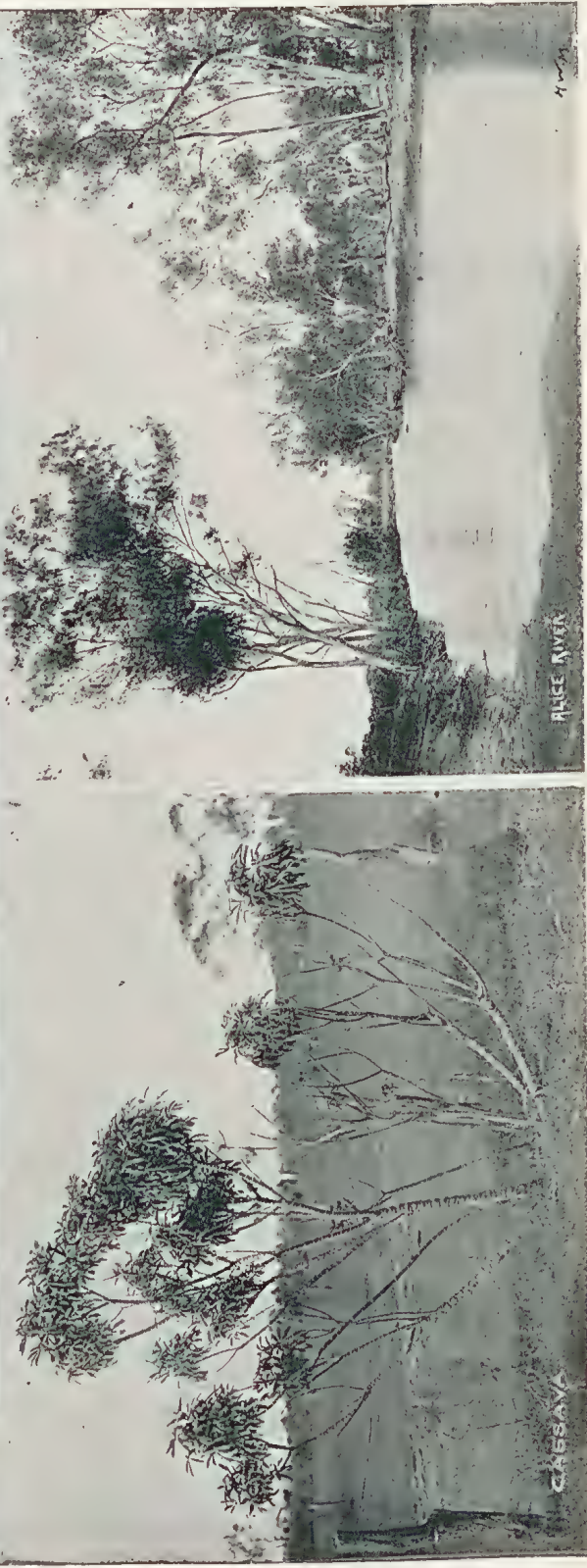
a farm belonging to Mr. W. Rhodes. This gentleman farms about 40,000 acres in the aggregate mainly for grazing, but he cultivates 30 or 40 acres of wheat, oats, barley, amber cane, and lucerne. The lucerne did fairly well, but was choked by salt bush. Amber cane and planter's friend grew last season during the drought of over 9 feet, giving 14 tons of green fodder per acre, and 45 lb. of seed in addition. The wheat was sown too late for grain, but yielded a good crop of excellent hay. The whole is irrigated from a bore giving 600,000 gallons per day. The soil is like that of all the Downs country, black and rich. The irrigation trenches are 6 feet apart. The water is of excellent quality, and has a temperature on leaving the bore of 146 degrees Fahr.

This visit to Longreach concluded our mission in the Central district, and it was all too short for the purpose in view, which was to study the question of agriculture, the suitability of the soil, the value of land prior to the advent of bore water, and its value since, and the possibilities of agriculture in the future; also the difficulties under which the farmers labour from distance from a market, and expense of transport. These will now be considered.

THE VALUE OF AGRICULTURAL LAND.

As has before been stated, there are two classes of land suitable for agriculture in the district under review—the desert and the Downs, or black-soil country. The term “desert” is a misnomer. It probably received its name owing to its sandy appearance, but since irrigation has been applied to the soil, it has been conclusively shown that so far from being a desert, it is exceedingly fertile, and responds readily to cultivation. The black soil is manifestly fertile, as testified by the splendid growth of Mitchell and other valuable grasses. Those farmers who have fairly tested its capabilities in the way of crop production, are unanimous in their praise of its excellence, and I had the opportunity of seeing for myself that they are right in their conclusions.

As for the original value of either description of country previous to supplies of artesian water being discovered, it was only of value to the squatter and grazing farmer, and then only in large areas at a very low rental per square mile. The district is in a dry belt and hence may be called semi-arid. During the late drought all vegetation on unirrigated areas disappeared and the squatter and grazier who held the lands suffered enormous losses. The value therefore could practically only be reckoned in pence per square mile. But as soon as cultivation began, and it was found that every farmer could supply himself with abundance of water for irrigation purposes or could obtain it by renting supplies from a neighbour, land values began to rise. The grazing farms held on a fifty years' lease became, to a considerable extent, agricultural farms, and as such their value rose from practically *nil* to from £1 to £4 per acre. Seeing that farming is now a pronounced success, these values will undoubtedly hold, and with the advent of more agricultural settlers owning freeholds, there is no reason why the higher figure should not generally represent the value of farming land near the centres of population. Take Alpha, Jericho, Emerald, and the rich lands in their neighbourhood. The latter township is 3 miles nearer to Rockhampton than is Warwick to Brisbane (166 and 169 miles respectively).



LONGREACH, ETC.

Plate XIX.



WHEAT HARVEST AT BARCADDINE.

Warwick and Killarney thrive on agriculture. Stanthorpe, 207 from Brisbane, can afford to send fruit and vegetables to Ipswich and Brisbane. There is no reason why the Central districts, where water for irrigation can be obtained, should not do the same, for the soil is quite as fertile and the climate admirably suited to wheat culture and vegetable growing. (*See* Plates XIX. and XX.)

As for fruit, at Alpha, 24 lb. is a common weight for water-melons, and exceptionally large peaches, fine oranges and lemons are grown there. I saw a 20-lb. water-melon passed into the train at this place at the end of January.

THE POSSIBILITIES

of agriculture are thus very great. If facilities are given to the public to take up the lands mentioned as homesteads or as conditional selections, so that they would eventually become freehold, and if only either practical, hard-working farmers or more wealthy men, who could afford to employ labour, could be induced to take up the land, there is nothing to prevent a considerable amount of close settlement. There is plenty of land—thousands of acres of rich soil—plenty of water, and a good market, with daily communication by rail from Longreach to Adelaide. And this railway communication brings before me the question of

RAILWAY FREIGHTS.

Agricultural produce, unlike many other industrial products, such as wool, preserved and frozen meats, tallow, hides, gold, timber, &c., &c., will only be sold to a profit if the freight charges are fairly low. This matter of freight on our railways has received, and still continues to receive, the most careful consideration of the Railway Department. The rural dwellers say that even if a railway makes no direct profit yet its low freights and fares tend to induce people to settle on the land, and to add to the wealth of the community, not by paying heavy railway charges, but indirectly by taxation on what they consume, on the agricultural implements they purchase, on the clothing they wear, on the thousand-and-one requirements of the agriculturist and grazier, and by the interchange of products between the cities and the rural communities. This question of railway freights is a matter which I cannot enter into here, still it is so intimately connected with the extension of agriculture in the Central district that it will not be out of place to consider how far they affect that extension.

Let us suppose an average crop of 24 bushels per acre of wheat at the usual price for that commodity—not drought price. We will allow 3s. per bushel delivered at the nearest railway station. This realises £3 12s., from which various charges have to be deducted as shown in the following table:—

Ploughing, Sowing Seed, Horsefeed, Repairs, &c.	Cost of Harvesting, from Stripper to Buyer.	Total Cost per Acre.	Yield per Acre.
<i>s. d.</i> 15 9	<i>s. d.</i> 6 5	<i>£ s. d.</i> 1 2 2	<i>Bushels.</i> 24
			<i>£ s. d.</i>
Gross proceeds of 24 bushels, at 3s. per bushel			... 3 12 0
Net return, per acre			... 2 9 10

The freight on wheat for flour from Barcaldine to Rockhampton (361 miles) is 34s. 7d. per ton for 1 ton, and 22s. 10d. per ton for a truck of 4 tons. This is equivalent to 6½d. per bushel at the lower rate. Now, if the rate were reduced to 4d. per bushel the farmer would benefit by the reduction.

From Emerald to Rockhampton (166 miles) the freight charge by rail is 20s. 8d. per single ton, and 13s. 7d. per ton for 4 tons. This charge amounts to a fraction over 4d. per bushel.

In the case of oaten hay 2 tons per acre is the average yield in this district. When oaten hay is selling in Rockhampton at £4 per ton the gross return of £8 per acre is reduced both by the railway freight of 34s. 7d. per

ton from Barcaldine to Rockhampton, and 20s. 8d. per ton from Emerald to Rockhampton, or 22s. 10d. and 13s. 7d. respectively for 4 tons, and by the cost of battens, hoop-iron, and baling in addition to the cost of ploughing, seeding, harvesting, and carting. Nor must the expense of irrigating be overlooked. I am not in a position to say what that cost would be, but there must always be at least one man on the work during the growing season. If sufficient wheat were grown in the district to keep a small flourmill going, if only during the season, the above heavy charges would be avoided or at least materially reduced. The Western farmers would get a higher price for their wheat, and the general population would pay £3 or £4 less per ton for flour.

Under the present conditions, with wheat at 3s., the Barcaldine farmer could reckon on getting a net return of a fraction over 2s. per bushel for his wheat, and about £2 per ton for his hay, and the Emerald man 2s. 3d. per bushel and £2 6s. 5d. per ton for hay when the price of hay is £4 per ton.

The freight on agricultural machinery is also very heavy. Reapers and binders are charged at £5 10s. 3d. from Rockhampton to Barcaldine, and £3 to Emerald; ploughs at the same rates, threshing machines also at the same. As for agricultural motors, they are not known in the Railway Department, none being as yet in use in Queensland. A special rate would therefore have to be struck for these machines when imported.

To the question, "Will it pay to grow wheat and other farm produce in the Central districts?" the answer is, "Yes," because, although freight charges are heavy, there is no uncertainty about the harvest. Every farm must be irrigated, and as one bore will only properly supply one farm, therefore every farmer must have a bore, or he need not attempt farming. Wheat-farming and maize-growing pay on the Darling Downs right away to Warwick, Killarney, and beyond, a distance of 169 miles from the former place to Brisbane by rail. Fruit and vegetables are sent to Brisbane from Stanthorpe—207 miles. It has been amply proved by the Alice River settlers that vegetables can be sent from the settlement to Rockhampton very profitably; how much more profitably from the country at and near Emerald?

The progressive farmers of the Central districts have proved to their satisfaction that farming there is decidedly a paying business, but it cannot be undertaken unless the intending farmer has sufficient capital to put down a bore costing from £300 to £500, or unless he is in a position to obtain sufficient water from a neighbour.

We shall have more to say on this subject when the crops about to be sown have made some progress towards ripening.

COMPARISON OF ANALYSES OF WATER—LONGREACH AND BARCALDINE.

										<i>Grains per Gallon.</i>					
LONGREACH.												Ry. Station.		BARCALDINE.	
Silica ...	...	...	...	...	...	3.36	...	Nil	...	...	...	...	...	Cronin's.
Iron ...	...	...	...	...	...	0.44	...	Nil	...	...	...	...	...	15.05
Calcium ...	...	...	...	...	...	0.97	...	Nil	...	...	...	...	...	} organic solids
Carb. sodium	...	...	...	...	...	61.40	...	66.5	...	...	...	...	...
Chlor. "	...	...	...	...	...	13.86	...	Trace	...	...	...	...	...
Chlorine ...	...	...	...	...	...	Nil	...	Trace	...	...	...	...	...
Total solids	...	...	...	...	...	80.81	...	66.5	...	...	...	...	...	17.19

SORGHUM POISONING.

Dr. W. Maxwell, Director of the Bureau of Sugar Experiment Stations, has forwarded to the Hon. the Secretary for Agriculture, the subjoined communication on the subject of the fatal effects resulting from the feeding of sorghum to stock prior to the plant having reached the feeding stage. So many losses have been sustained by stockowners, owing to allowing the cattle to graze on young sorghum, that we cannot but wonder that sensible farmers still continue the practice. Dr. Maxwell now makes it perfectly clear that the plants up to seven weeks old contain a deadly poison scientifically known as

hydrocyanic acid—in plain English, prussic acid. Strong prussic acid will kill an animal which merely takes a sniff at it. Children have died from eating many apricot and peach kernels, both of which contain prussic acid. *Verb sap.*—a word to the wise.

Dr. Maxwell writes :—

I have the honour to make a preliminary statement upon given investigations that are being conducted with certain green crops in order to determine the presence, or non-presence, of given poisonous bodies. The results of the investigations, so far conducted, make it advisable that a brief statement should be made at once to our farmers and others using such green crops for feed. Examinations at different stages of growth of sorghum show that the plant in its early history contains distinctly fatal amounts of hydrocyanic acid. The object of the examinations is to determine at what age sorghum and similar plants, containing these poisonous bodies, can be safely used. So far the samples cut, reaching up to an age of seven weeks, still contain highly dangerous, in fact fatal, amounts, if fed in liberal quantities. The chemist, Mr. Brünnich, who has exclusive charge of the laboratory work, is still engaged on the matter, and I hope, before very long, to make a full statement. In the mean time, however, it is strictly advisable to notify the farmers of the almost certain danger, as many have discovered, of feeding young sorghum to cattle. It is indicated that it will not be safe to give cattle free access to sorghum—that is, to eat as much as they like—until it has reached the seeding stage. This question, however, it is hoped to have settled within a few weeks. The Laboratory is also engaged upon other plants, including maize, Kafir corn, &c., with a view to determine their safeness, during their early growth, for feed.

The investigations also promise to prove beyond question a statement previously made by me that the amount of the poisonous body (hydrocyanic acid) present in the plants is very largely controlled by the nature of the soil, or, in other words, by the amount of nitrogen that the soil contains. This fact will make it also clear that sorghum, for example, which is grown upon rich soil, is likely to be much more dangerous during its early stages of development than the same plant grown upon poor soils. These matters, however, will be made clear in a fuller statement as soon as the investigations are completed.

I beg to urge the immediate distribution of this information through the public Press, since this is the particular time when these green crops are being fed to cattle.

HARVESTING WHEAT CROPS.

At the Congress of Bureaux of Agriculture of South Australia Mr. S. Trengove-Bate read the following paper on the subject of harvesting the wheat crop :—Which is the best means of harvesting the crop? That the old method of stripping and cleaning will have to give place to the complete harvester is already granted by a large majority of farmers. The new machine does the work better and at a lower cost. Although the complete harvester is considered by most farmers to be the best machine for harvesting, I beg to disagree with them on this point. In my opinion the binder and header system is the most profitable. We have tried this side by side with the stripper for four years and with the complete harvester for two years, and the largest amount of profit has always been with the binder and header.

By using the binder the farmer can start harvest quite twelve days earlier on the average than he could with stripper or harvester. The risk of loss from the storms that often visit us in the earlier stages of harvest, and from fires that may travel through a large area of crop, is reduced very considerably. Not only so, but our experience is that we get wheat of a higher standard, the

weight often being some pounds per bushel heavier than wheat left to ripen for the stripper. Again, there is the question of rust. Last season we had a crop badly affected by rust; so much so that we had no hope of the grain reaching the standard of 62 lb. per bushel. We cut some of this with the binder, stacked it, and threshed it after the other crop was stripped. The wheat when cleaned weighed 68 lb. per bushel, whereas the wheat from the stripper weighed only 58 lb. per bushel, and the yield was 8 bushels per acre, instead of 16 bushels, which it would have produced if cut with the binder in time. The greatest advantage derived from the use of the binder is, however, the wonderful saving resulting from the use of the straw, which is valuable food for stock. It was recently pointed out in one of the agricultural journals that analyses had shown the straw from a wheat crop cut early and headed was very much better than ordinary straw from a stripped crop.

Many farmers object to use the binder because they think more wheat is shaken out, but practical experience has shown that there is less wheat left on the ground than after the stripper; while the system advocated will secure as much or more wheat per acre than any other method of harvesting. In seasons when there is no rust even ripe wheat cut with the binder, if of a tough variety, will not shake out. This is readily proved by examining after the winter rains the portions harvested with binder and stripper. On the land where the stripper was used there will be found much more wheat than where the crop was cut with the binder.

That the method of harvesting advocated is more expensive than either of the other systems I readily admit, but not to the extent most farmers think. At any rate the system I adopt is, I am quite satisfied, the most profitable in the end. One man can cut with the binder quite as large an area a day as he can strip, while a man can stook 12 to 15 tons of sheaves daily. The cost of cleaning after the header is a little higher, but carting to market is the same, except in rusty seasons. The extra expense is in the outlay for twine and the labour employed in stooking, carting in from the paddock, heading, and restacking the sheaves. We cart and stack the sheaves near the header, and then, when we have finished the ordinary harvest, we do the heading. By stacking before harvest the wheat ripens better than if left in the paddock, and the straw does not get so dry and brittle. Five men are required to work the header, &c., properly. They can with 4-h.p. horseworks and header to correspond, head, and restack $2\frac{1}{2}$ tons per hour. As compensation for this expense the farmer has the straw which, when chaffed, finds a ready sale at from 5s. to 10s. per ton less than good coloured hay chaff. If he does not sell it he has a supply of food for his stock, which he will find much more profitable than cocky chaff.

The farmer who intends to head his wheat will find it important that he gets a binder with a perfect buttor, as if the heads are not fairly level there will be a considerable waste, or, rather, a quantity of wheat will be left in the sheaves to enrich the feeding quality of the straw. It is important, too, that the ground should be free from stumps, or, if that cannot be secured, all the higher ones should be cut level with the surface, and the ground rolled to enable the binder to cut as low as possible.

We have headed three different kinds of wheat, viz.:—Steinwedel, Purple Straw, and Dart's Imperial. The first come in very early, a desirable characteristic, but shakes too easily, and the straw is too brittle, and consequently is of less value than many other kinds. Purple straw is a good wheat to head, but we prefer Dart's Imperial, as it is a tough wheat, and does not shake out and waste in handling. Its chief fault, however, is that it is difficult to get in early enough to enable one to cut it much before the early wheats are fit for stripping. I would advocate for heading an early variety with a good straw, and one that does not shake out. Although I have not grown it myself, I think the Gluyas Early will be a good wheat to grow for heading.

The following are estimates of the cost of harvesting under the three different methods, taking as an example a crop 3 feet high, averaging 16

bushels of wheat and 1 ton of straw. Any crop less than 3 feet in height should not be cut for heading:—

The Stripper.

	s.	d.
Cost of stripping, per acre	3	0
Cleaning four bags of wheat	1	8
Cost per acre	4	8

The Complete Harvester.

Stripping... ..	3	6
Sowing up bags... ..	0	4
Cost per acre	3	10

Binder and Header.

Cutting and twine	4	6
Stooking	0	5
Carting and stacking	3	6
Heading and restacking	3	6
Cleaning	2	0
Cost per acre	13	11

Taking a 50-acre paddock the figures work out—

	£	s.	d.
Stripper	11	13	4
Complete harvester	9	11	8
Binder and header	34	15	0

It must be remembered, too, that proportionately a crop 3 feet in height is the least profitable to bind and head. The cost of cutting and heading a 6-foot crop is no more than one only 3 feet.

On last year's basis, the financial results from the two crops previously referred to work out as follows:—

	£	s.	d.
16 bushels wheat at 2s. 6d.	2	0	0
1 ton straw at £2	2	0	0
	£4	0	0
Cost of heading, &c.	0	13	11
Net return per acre... ..	£3	6	1

Stripper.

8 bushels weighing 59 lb. per bushel at 2s. 3d. ...	0	18	0
Cost of stripping	0	4	8
Net return	£0	13	4

I freely admit that it is only under special conditions—such as losses from rust, storm, or fire—that there will be such a marked return in favour of the system I am advocating, but my experience has been that under all conditions it is the most profitable way of harvesting the crop. If we put the value of the straw in the stack at 10s. per ton, from this alone we more than make up for the extra outlay.

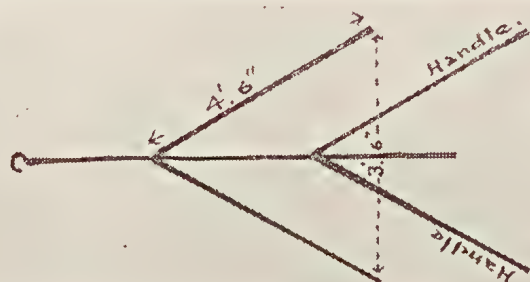
LIFTING MANGELS.

A correspondent of the *Agricultural Gazette*, England, furnishes that journal with the accompanying diagram and description of a simple implement for lifting mangels.

He says: I have tried an implement for the first time this season which, I think, is a much quicker way than pulling by hand, and does not bruise the mangels but very little it is made entirely of wood.

Take two pieces of wood about 4 feet long and 6 inches deep, join them together at one end, and spread them about 3 feet 6 inches the other end, they will then be like the letter V; only the end where they are joined together must go in front. Then take another straight piece of wood and fix in the centre, for a beam with a crook at one end to fasten a horse to, then fix on two wood handles to steer it by. I have also fixed a wheel to mine, just behind the horse, to keep it from going in the ground too deep. You must put a weight on it to keep it steady; I take a bag and fill it with earth from the field, which will answer very well. Let the horse walk between the rows, and the two boards, which are a good bit wider than the rows, will push the mangels out of the ground, one row each way; then when you come back again it will push another row into the one you did going up. So you will have two rows together with plenty of room between for the cartwheels without crushing the mangels.

You must top the mangels in the ground before you take them up; one man with a horse and a pair of reins to steer the horse by, can come on after the toppers and can keep three topping. I have enclosed a rough sketch



of the implement, which can be made for a few shillings by any carpenter. I made mine myself, so if any farmer likes to make his own he can do so, if he knows anything about carpentering. If anyone would like to try it and wants any further information, I shall be only too glad to give it.

MONTHS DURING WHICH FARM AND GARDEN CROPS MAY BE PLANTED.

Amber Cane—September.

Arrowroot—September.

Artichokes—July to September.

Asparagus—August to October.

Barley—March and April.

Beans—March and April for an early crop; September or October for a late crop.

Beets—Early winter crop, February; summer crop, August and September.

Brown Millet—August; also February and March.

Cabbage—March to June. Small sowings may be made throughout the year.

Carrot—January, February, and March, with small sowings for succession.

Cauliflower—For winter crop, December and January; summer crop, June and July.

Celery—January.

- Citrus Fruits—July and August.
Clover—March.
Coffee—August to November.
Cotton—September.
Cow Pea—September.
Cucumbers, melons, pumpkins, squashes, vegetable marrows—August and September.
Culinary Herbs—February.
Date Palms—July.
Field Peas—April to August.
Fig-trees—August.
Flax—March to September.
Granadilla—September.
Grapes—July.
Ginger—August.
Hemp (Sisal)—September.
Imphee—August.
Jackfruit—August.
Jute—September.
Kafir Corn—August to January.
Lucerne—March to July.
Maize—August to January.
Mangels—August and September.
Nectarine—July.
Oats—March and April.
Onions—April.
Panicum—August; also January.
Passion-fruit—All the year round.
Peach—August.
Pear—August.
Persimmon—July.
Pineapple—August.
Plum—July.
Potatoes—September, February, and March.
Rape—September.
Rhubarb—August.
Rice—July.
Rye—March and April.
Sorghum—August to January.
Strawberries—February to March.
Sweet Potatoes—September.
Sugar-cane—August to November.
Teosinte—August to January.
Tobacco—September.
Vetches and Tares—August to February.
Walnut—August.
Wheat—March, April, and May.
Yams—September.

Vegetable seeds generally should be sown from March to September, and small sowings may be made all the year round, weather permitting.

The seasons in Central Queensland will be earlier than in the South.

Dairying.

THE DAIRY HERD.

QUEENSLAND AGRICULTURAL COLLEGE.

RETURNS FROM 1ST TO 31ST JANUARY, 1903.

Name of Cow.	Breed.	Date of Calving.	Yield of Milk.	Per cent. Butter Fat, Babcock Test.	Commercial Butter.	Remarks.
			Lb.		Lb.	
Annie Laurie	Ayrshire...	10 Aug., 1902	597	4.0	26.74	
Annie	"	1 Nov. "	609	3.6	24.55	
Blink	"	28 April "	326	4.0	14.60	
Bonny	"	15 May "	551	4.1	25.30	
Laura	"	12 July "	718	4.0	32.16	
Lottie	"	17 June "	457	4.2	21.49	With first calf
Laverock	"	14 Aug. "	719	3.6	28.99	
Lass	"	11 July "	628	3.6	25.32	With first calf
Linnett	"	10 Sept. "	793	3.6	31.97	
Lowla	"	31 Oct. "	538	3.8	22.89	
Lavina	"	5 Sept. "	831	3.5	32.57	
Renown	"	21 April "	582	3.7	24.11	
Ruby	"	24 July "	680	3.5	26.65	
Rosebud	"	4 Dec. "	1,055	3.6	42.53	
Ruth	"	18 Dec. "	800	3.7	33.15	
Ream	"	10 Jan., 1903	433	3.8	18.42	
Carrie	Jersey	15 Sept., 1902	609	4.8	32.73	
Playful	"	3 July "	655	4.4	32.27	
Stumpy	"	17 Mar. "	588	4.5	29.63	
Sweet	"	6 June "	364	4.2	17.12	With first calf
Ivy	"	24 Oct. "	622	4.8	33.43	
Eileen	"	4 Nov. "	558	5.0	31.24	
Jersey Belle	"	17 Jan. "	716	4.1	32.87	
Effie	"	17 Nov. "	790	4.4	38.93	
Damsel	Holstein	29 July "	400	4.0	17.92	
Guinea	Shorthorn	9 June "	619	3.6	24.95	
Lucy	"	14 Aug. "	711	4.0	31.85	
May	"	26 June "	501	3.6	20.20	
Nestor	"	31 July "	754	3.7	31.24	
Queenie	"	2 Sept. "	648	3.6	26.127	
Rose	"	10 April "	527	3.6	21.24	
Violet	"	6 Dec. "	709	3.5	27.79	
Winnie	"	17 June "	554	3.5	21.71	With first calf
Kit	"	27 Nov. "	858	4.0	38.43	
Louisa	"	3 Jan., 1903	675	3.8	28.72	
Fancy	South Coast	19 Jan., 1902	534	4.2	25.11	
Grace	"	1 Sept. "	639	3.6	25.76	
Topsy	"	4 Oct., 1901	502	4.0	22.48	With first calf
Alice	Grade Shorthorn	18 Jan., 1902	66	5.0	3.69	Dry, 10-1-03
Drone	"	12 May "	432	4.0	19.35	With first calf
Lemon	"	18 June "	601	4.3	28.94	With first calf
Peggie	"	19 April "	466	4.1	21.39	
Princess	"	5 June "	495	3.5	19.41	With first calf
Rowly	"	22 April "	546	4.0	24.46	With first calf
Rosella	"	1 Dec. "	657	3.9	28.69	
Brindle	Grade Jersey	6 June "	633	4.2	29.77	With first calf
Witch	"	13 May "	538	4.1	24.70	With first calf
Mona	Holstein	3 June "	699	3.6	28.18	With first calf
Reanie	"	7 Mar. "	595	3.8	25.32	With first calf
Night	Holstein Devon...	29 April "	470	4.0	21.05	With first calf

The herd was fed on natural pasturage only.

HIGH-CLASS STOCK FOR TOOWOOMBA.

Messrs. Gorrie and Franklin, of Carina Jersey Farm, have just sold to Mr. J. H. Cecil Roberts, of Croxley, Toowoomba, the young Jersey bull Milkboy. This bull took first prize in the 15-months' class at the last Exhibition at Bowen Park. He is by the champion bull Milkclad 4th, out of a heavy milking cow. Mr. Roberts usually imports his bulls for the Croxley herd, but on seeing Milkboy he did not hesitate to purchase, considering him a bull of rare quality. The price paid was twenty-five guineas.

THE PRODUCTION AND JUDGING OF SWINE.

Professor W. J. Kennedy, Vice-Director of the Iowa Experiment Station, Professor of Animal Husbandry at the Iowa Agricultural College (U.S.A.), lately delivered a very exhaustive lecture on pig-raising. Amongst other things he said:—

A famous agriculturist, when asked what in his opinion was the first and most important requisite in the successful production of swine, said:—"A knowledge of what constitutes the perfect hog and the practical application of the same is the swine herd." No man ever gave utterance to a truer statement. A thorough knowledge of the underlying principles relating to the breeding and feeding of our domesticated animals is also indispensable. No man can afford to underestimate the value of the same. They are, however, but the means to an end. The success of the sculpturist and the painter is guided solely by the height of his ideal, and the nearness to which he approaches the same. Just so with the breeder of live stock, his success will be determined largely by his standard of excellence and the nearness to which he approaches the same in his breeding herd.

THE END OF THE HOG.

The ultimate end of the hog is the block. Thus the perfect or ideal hog is the one which most nearly meets the demands of the consumer. The butcher's preference is almost solely controlled by the demands of the market. All markets do not demand the same kind of hogs. In some the bacon hog, so named because of its long deep side, is preferred; while in others the fat or lard hog is the most popular, especially where the demand is for hams, broad loins, and fat backs. Thus in forming an opinion as to the best type of swine to breed it is well to keep the requirements of these two markets in mind. They have established for us two very distinct market classes of hogs, the fat hog and the bacon hog.

For the present we will confine our attention to the leading features of the fat hog, as the bacon hog will be taken up more fully later on. The fat hog of to-day is undergoing a change of form. The chubby broad-backed hog, once so popular, is losing prestige. More length of body and depth of side are being demanded of him. The wise breeder will weigh these two points carefully when selecting new stock.

As previously stated, the butcher's preference should be adhered to very closely. The profit in the production of hogs largely lies in successfully catering to the butcher. There are some other points, however, which must be considered in this connection. The evidences of constitution and vigour are points on which the butcher cannot realise profits. To the feeder and the breeder, however, they are of the utmost importance. No man can afford to under-estimate the value of constitution and vigour. They are the best specifics as yet discovered to ward off the ravages of hog cholera.

In the judging of any class of live stock, system is indispensable. Thus in studying the form of the fat hog it is of vital importance that a logical method be employed. The more important points should be given most attention;

thus might well come in for first consideration. Following the order of the score card used for student work, they might be discussed as follows :—

Form.—Under form we include the top and lower lines, the width, depth, length, and lowness to the ground. The hogs that make the greatest gain at an early age and meet the demands of the butcher best are lowest, deep, and wide. They are compactly built, deep-chested, medium length of body, well sprung in the ribs, possess straight top and bottom lines, and stand squarely on short, straight, strong legs. The weight of the hog might also be considered in this connection. This is a variable point. It changes from time to time, depending on the demand for lard and so on. When lard is low in price the 200-lb. hog may be in favour, while in a short period of time the 400-lb. hog will be topping the market. Generally speaking, the hog weighing from 250 to 325 lb. will be found the most profitable to handle. Up to this weight gains can be made more economically than at heavier weights, a point which every feeder must consider.

Quality and Condition.—Quality is indicated by the hair, bone, and nature of flesh. The hair should be fine, straight, thick, and lie close to the body. Coarse, wiry, swirly hair is not desired, as it is usually associated with coarseness of frame and undesirable feeding qualities. The bone should be medium fine, enough bone to carry the body is all that is desired. Coarseness of bone is discriminated against by the butchers ; it is an indication of a tendency to dress out a large proportion of offal. The flesh should be free from lumps or wrinkles, both of which are very undesirable. The indications of good condition are a deep, even covering of firm flesh, especially over the back loin, hams, and sides, as they are the regions where the valuable cuts are found.

Head.—A short, broad head, especially wide between the eyes and ears is usually associated with width and compactness of body throughout, and is an indication of an aptitude to fatten readily. A snout of medium length is desirable.

Eyes.—The eyes should be clear, large, wide apart, and free from wrinkles or folds of fat which often cause blindness.

Ears.—A small fine ear indicates refinement throughout, thus is desirable. The carriage of the ear will depend upon the parentage of the hog, being erect in the Berkshire, half drooping in the Poland China, and almost wholly drooping in the Duroc-Jersey and most of the large white hogs.

Jowl.—A broad, neat, smooth, firm jowl is desirable. Flabbiness and jowl, due to excess of fat in this region, are very objectionable.

Neck.—The neck should be short, thick, and deep. It should blend smoothly into the shoulder vein and shoulder without any depression.

Shoulder and Shoulder Vein.—The shoulder vein is that portion just in front of the shoulder where the neck joins the shoulder. Fulness in this part is very desirable, as it usually results in a smoothly-covered wide shoulder. The shoulder should be broad, deep, and compact on top. Prominent shoulder-blades and a slackness between the same are very objectionable.

Front Legs and Feet.—The legs should be short, straight, strong, and squarely placed under the body. The pasterns must be short, straight, strong, and the hog should stand well up on his toes. Many hogs are “knock-kneed”—that is, the knees come too close together. This is very objectionable in any class of hogs, but more especially in young animals, as it gets worse with age. Too much stress cannot be laid upon the set and strength of the legs.

Chest.—This is a point which the butcher pays little or no attention to, but it is of vital importance to the breeder. Width and depth of chest give stamina and constitution to the hog. The floor of the chest should be wide and close to the ground. There should be no falling away in the lower part, giving a “tucked-in” appearance in the fore flank.

Sides.—The sides should be deep, long, evenly fleshed, carry width well down, and free from wrinkles. In many instances the hog with a broad back

due to a well sprung rib is sadly deficient in depth of body and width of same in the lower parts. In other words, too many wide-backed hogs are wedge-shaped from above downwards. It is not only desirable to have a broad back; it should be associated with a good length of rib, giving a deep side with as much width at the bottom as there is on top. Length of side is also very desirable, even in the fat hog, on account of the increasing demand for lean meat. Any indication of wrinkles or creases in the flesh behind the shoulder or any place along the side is very objectionable. They denote uneven fattening and flesh of poor quality. The sides of a good fat hog are even with a line from his shoulder to his ham. There should be no depression between the same. Some hogs show a depression due to an abnormal development of shoulder or ham.

Back.—The back should be straight, broad, and evenly covered with flesh. Viewing the hog from the side the back should be straight in aged animals and slightly arched in all young stock. With advanced age the back is almost sure to settle—thus the straight-backed young animal usually develops into a sway-backed aged animal. Width of back is very essential. Many hogs are so sharp in the back that they are designated as “sun-fished.” When fat they should possess an even covering of thick flesh.

Loin.—The loin should be wide and evenly covered with thick flesh.

Hind Flank.—The hind flank should be deep and on a line with the belly. A well-let-down hind flank is usually associated with a well-developed ham. A full and pendant hind flank is an indication of readiness for market.

Hips.—The hips should be wide apart, low, and smoothly covered with flesh.

Rump.—The rump should be long, smooth, and carrying width well back to tail head. There should be but very little depression or falling off from the hip joints to the tail head. Most hogs are inclined to drop off some, but straightness in this region is desirable. In the eyes of many people, a dropping rump in a hog is not considered to be objectionable. This must be due to the fact that they are more accustomed to seeing hogs of that formation than those straight or nearly so. More width of rump is found where the animal approaches straightness than is usually found in the animal possessing drooping quarters. The length of quarter to a certain extent seems to be governed by the same rule. Another very common objection, in fact, one of the most serious faults to be found in the hog, is crooked hind legs and sprawly pasterns. The careful observer of animal form will soon notice that crooked hocks are nearly always associated with drooping rumps. Seldom if ever is the crooked hock found in the animal possessing a straight rump. Recognising these points, is it not advisable for us to pay more attention to the breeding of hogs with straight rumps?

Hams.—In viewing the ham from the side it should be wide, plump, and well carried down to the hocks. A great many hogs having good width of ham are very deficient in the way it is carried down to the hocks. This is an important point.

Hind Legs and Feet.—The hind legs should be well set, straight, short and thoroughly supported below the hocks. Too much stress cannot be laid on the conformation of the hind legs and feet. Here is one of the very weakest points in our fat hog. Many hogs have excellent form but poor feet and legs, thus are compelled to go begging in the market as cripples. The legs should be short, pasterns short and strong, and the hog should walk on his toe, not on his dew-claws.

The above remarks are descriptive of a fat hog without any reference whatever to breed. A hog is good of his breed first as he approaches the above description, and, secondly, as he approaches the colour markings, formation of head, ear, body, &c., of his breed. In selecting swine for breeding purposes in addition to the requisites demanded by the market and the characteristics of the breed, the question of sex characteristics must be duly considered. The boar, for instance, must show marked evidence of masculinity. These are

more noticeable in the head, neck, and shoulders than in the other parts of the body. The head may be inclined to coarseness, the neck full, somewhat arched and in the case of nature animals a well-developed shield is usually seen. The forequarters are usually slightly heavier than the hindquarters. The sow should not show any indication of masculinity as indicated by coarseness of head, neck, or shoulders. She should be rather long in the body to ensure good breeding qualities.

FACTS ABOUT DISHORNING.

A few weeks ago a prosecution was conducted against a grazier successfully for dishorning cattle in Victoria. This question is agitating public thought in America, and the *Rural New Yorker* is sending out the following questions to the leading stockowners:—

“What proportion of fat cattle are now sent to market with their horns on? If they are thus sent, why do feeders now cut off their horns? Are most of the horns killed on the calf’s head, or do they wait until the horns are grown before cutting? Do breeders of pure-bred stock, such as Shorthorns and Herefords, dishorn their pedigreed animals?”

ANSWERS.

“Nearly all cattle sent to market are dishorned from this section. Most of the cattle are dishorned at the age of one or two years. Some horns are killed on calf’s head, but not many. I think owners of pedigreed stock dishorn some of their animals, but not all. The object in dishorning is to prevent cattle hurting each other while feeding, and especially to prevent injury while shipping. Very few cattle die from dishorning, even after they are grown. I should say 1 per cent. would be a large estimate.

“J. C. CALDWELL,
“Danville, Ky.”

“Ninety per cent. of the cattle that are fed for beef are dishorned. Feeders who send cattle to market with horns on are robbing themselves, as buyers do not pay as much for horned cattle as for those of the same quality that have no horns. It is no trouble to dishorn cattle, and if you will begin in time you can have the horns all off. I have something like 300 cattle, and not one has horns. More cattle can eat at the same trough, and more cattle will stand in the same shed, that have no horns. Very few horns are killed on the calf’s head; they are most usually dishorned at about one year old. At that time they are easily and quickly taken off by any of the dishorners. Very few pure-bred cattle that have horns are dishorned. The breeders are much opposed to it, as prospective buyers are apt to think they would better buy a polled breed.

“M. A. JUDY,
“Williamsport, Ind.”

“Our experience with feeders and fed cattle is that the larger proportion now going to the feed yards are dishorned as calves, sometimes when yearlings. A few horns are killed on the calves’ heads, but that is not as sure to be satisfactory as to wait until the horn is started enough to clip readily. A nice bunch of feeding cattle smoothly dishorned will bring in Chicago or Kansas City 25 cents more per 100 lb. than horned cattle. Of course, it only costs 15 cents per head to have them taken off, but when the feeder buys them he does not want to wait for them to heal, nor does he want the set-back that would be natural after the operation. As to breeders of pedigreed cattle, they do not as a rule dishorn their show stock, as they do not so readily show their breeding when dishorned. I will also say that each year finds a larger proportion of range cattle dishorned. As the wolves are exterminated they have no need of horns, and they handle and ship much better, also feed on less corn, as they do not use up energy fighting each other away from the feed troughs and around the feed lots.

“JOHN A. CARSWELL,
“Lone Rock, Wis.”

Poultry.

LAYING RECORDS.

QUEENSLAND AGRICULTURAL COLLEGE.

	Number of Hens.	Number of Eggs Laid.				Total 6 Months.
		Previous 3 months.	November.	December.	January.	
Buff Orpingtons	5	235	75	80	75	465
White Leghorns	7	273	126	126	119	644
Brown Leghorns	3	126	48	45	48	267
Black Orpingtons... ..	4	156	68	60	60	344
White Wyandottes	6	234	96	90	84	504
Silver-laced Wyandottes	5	190	75	75	70	410
Plymouth Rocks	2	70	34	32	28	164
Minorcas	3	90	54	51	48	243
Silver-grey Dorking	5	185	75	65	60	385
Spanish	6	204	71	80	65	420
Langshans	3	84	45	39	39	207
O. E. Game	5	160	45	45	40	290
Light Brahmas	3	60	30	21	12	123

The fowls have not been in any way forced or stimulated for a large egg-production. Owing to errors in typewriting in the last return, the records of the White Wyandottes and White Leghorns were transposed. "Brown Orpingtons" in January's issue of the *Journal* should have read "Brown Leghorns."

FOWLS MOULTING.

By W. HINDES, Poultry Expert, Queensland Agricultural College.

The moulting season is the most critical period of a fowl's life, and great care is required at this time. Food of a nutritious character should be given. Meat scraps and green cut bone are among the best foods at this season. The man who makes the largest profit out of poultry is the one who gathers eggs in abundance when they are scarce and prices high, and to get the hens through a quick and successful moult will help to fill the egg basket at this time. Fowls, however, should not be too fat when commencing to moult, as a fat fowl never moults well. A very good plan with incubating breeds is to let them sit for two or three weeks late in the season; this gives them a rest, and, as they are fed once a day only, it also reduces them in flesh, so that they can stand a more liberal diet at moulting time. Non-sitters should also be fed a little more sparingly, with a non-stimulating diet, for a little while before starting to moult, but as soon as ever they begin to grow new feathers, they should be well fed all through the moulting period, after which it will not be long before they recommence laying. Feeding to fatten alone will not do; a good variety of food should be given, milk is very good for them, and is greatly relished. If the fowls are confined, keep them busy by feeding their grain in some litter, so that they will have to scratch for it. The process of feather making is very exhausting, and the birds, being only partially feathered, are subject to colds, and may need a tonic; a little sulphate of iron in the drinking water, just sufficient to give it a slightly bitter taste, will help them greatly. One thing which should not be overlooked is the fowlhouse; make sure it is perfectly sweet and clean, and free from lice. Whitewash the house with hot lime wash

into which put a little carbolic acid ; see that it runs into all the crevices, for that is where the little red mites will be if there are any. If the fowls are infested with the long, narrow louse, generally found on the wing feathers, dust them with insect powder (pyrethrum), which will kill them. By attending to these small matters at this season, the fowls should moult well, and be a credit to the owners.

HOW TO TELL A PURE BUFF ORPINGTON.

A correspondent asks what points distinguish the buff Orpington and the buff varieties of Wyandottes and Plymouth Rocks? A writer in the *Farmer and Stock Breeder* says :—

BUFF ORPINGTONS, WYANDOTTES, AND PLYMOUTH ROCKS.

Buff Orpingtons and the buff varieties of Wyandottes and Plymouth Rocks are frequently confused with one another by those unacquainted with the various breeds. It is, however, a very easy matter to distinguish between the three varieties mentioned, though on first sight they may appear to be very similar to one another.

There is no excuse for mistaking a buff Wyandotte for anything else, as this fowl has a rose comb, while both buff Orpingtons and buff Plymouth Rocks have single combs. These two last may readily be distinguished from one another by the colour of the legs, buff Orpingtons having white or flesh-coloured legs, while these are yellow in colour in the case of Plymouth Rocks. Buff Wyandottes also have yellow legs. Besides the characteristics just named, which readily serve to distinguish the three varieties from one another, they differ or should differ in shape.

Buff Plymouth Rocks are not so much bred as buff Wyandottes, but they are fairly popular. The same point, viz., the shape of the comb, which serves to distinguish buff Plymouth Rocks and buff Wyandottes from one another, also distinguishes the white and the black varieties of these two breeds.

Albions can readily be told from white Plymouth Rocks by the fact that the former have flesh-coloured legs, while in the latter variety the legs are yellow in colour.

TO FATTEN LIVE STOCK.

Mr. John Kammer, of Chicago, is reported to have invented a process likely to revolutionise the practice of fattening live stock, especially cattle. The invention is in the hands of the American Grain-growing Company of Chicago, and consists of a large galvanised iron case, covered with a layer of common wood moss, compressed by wire netting, and capable of absorbing a large amount of water, inside the case are drawers in which corn is placed in layers 3 inches thick, and water is poured into the moss, when the grain begins to sprout, and in about four days is ready to be fed to stock. Fresh corn is substituted, and the process of sprouting repeated. The cost of the invention is said to be exceedingly low, and cattle eat the grain treated by it with great relish, and fatten very rapidly. The grain in sprouting doubles its weight, and becoming soft and nourishing, is entirely assimilated, which is not the case with corn fed in the ordinary way. By this invention the best kind of beef is said to be produced, it being firm yet tender, and the fat equally distributed throughout the lean.

The Orchard.

PINEAPPLE CULTURE.

By ALBERT H. BENSON.

PART II.

PREPARATION OF THE LAND.

In addition to choosing the right kind of soil for pineapple culture, it is essential that the land be brought to a state of as nearly perfect tilth as possible prior to planting. No matter what method of planting may be adopted, the land must be in a state of perfect tilth if the best results are to be obtained; in other words, don't plant your pines till the land is ready for them, as initial cultivation can always be carried out in a much more thorough and satisfactory manner than any subsequent working.

The young plants get a better start, as they commence to make roots at once, and thus become quickly established, make more vigorous growth, and consequently produce larger fruit.

When new land is chosen for the plantation, whether it be scrub or forest, it should be well cleared to a depth of at least 18 inches, and all roots should be run to this depth, so that any that may remain in the land will be out of the way of subsequent cultivation.

The top soil should be reduced to a fine tilth, and the subsoil should be thoroughly stirred as deeply as the roots left in the ground will permit, thus rendering a large body of soil and subsoil available for the plant's use.

The thorough preparation of the land prior to planting is beneficial in many ways, as it not only sweetens the soil and renders it suitable for plant growth, but it increases its capacity for retaining moisture during a dry spell, and improves its drainage during a wet spell.

The preparation of old land is similar to that of new ground, with the exception that if properly cleared at first there should be no trouble with roots, and also the surface soil having been under crop should be thoroughly sweet. Soil and subsoil should be reduced to a fine tilth, as in the case of new land, and the land got into the best possible order, all weeds, couch grass, blady grass, &c., being carefully destroyed.

In the preparation of the land short-breasted ploughs of the digging type are to be preferred, as they produce more mould or a finer tilth than the English type of long-breasted ploughs. Disc ploughs answer well, and in light land, free from stones, will, I believe, be found to do nearly perfect work, as they leave the land light and open, conditions particularly adapted to the growth of pineapples.

Any good subsoiler having a strong bull-tongue share which will burst up the land well will answer, but, failing this, a strong plough without the mouldboard, and with a narrow share, run in the bottom of the furrow will do fair work and give good results. Where there is only a small area under cultivation hand culture, such as forking the land to a depth of 14 inches or more and working this down fine, will give excellent results, in fact the best, but at the price of labour it is too expensive a method to employ for any large area. Pines are generally considered to be mere surface rooters, and therefore not to require cultivation such as I have described, but I can assure my readers that a thorough preparation of the soil pays handsomely, and that it has been proved over and over again in this State. When the condition of the soil permits, pines are by no means surface rooters, especially the smooth-leaved varieties, as they will send their feeding roots to a considerable depth, and not only that, where they root deeply they make a more vigorous growth and stand dry weather better than when the bulk of the roots are on or near the surface.

WHAT TO PLANT.

In this State, pines are propagated in several ways—

1st.—By means of suckers—viz., shoots coming from or near the base of the parent plant. Suckers are usually preferred by the majority of our growers, as they bring in the quickest return, and when carefully selected produce vigorous plants.

2nd.—By means of gill sprouts or slips, or, as they are locally called robbers—viz., shoots that grow from buds that originate at the base of the fruit. If these sprouts are allowed to develop after the fruit has been gathered, they form excellent plants, especially in the case of the Smooth-leaved Cayenne. This variety does not, as a rule, produce a large number of suckers; hence, when a large number of young plants are required, it is necessary to fall back on the gill sprouts. They are preferred by some growers to suckers, although they are usually some months longer in the ground before they produce fruit. The reason for this preference is, that the sucker often produces an inferior first pine, owing to the fact that the fruit is sometimes formed before the sucker is properly established; whereas in the case of the gill sprout the plant becomes firmly established before flowering, hence the first fruit produced is of good size and quality.

3rd.—By means of the crown—viz., the tuft of leaves that grows on the top of the fruit. This method of propagation is seldom resorted to, as it is too slow, the top taking at least two years to produce a fruit.

4th.—By means of stumps—viz., old plants that have produced a fruit, and from the last of which, strong suckers will come when planted. This method is preferred by some growers, who claim that they obtain the best results thereby, as the suckers produced are usually very vigorous and bear good fruit.

When plants are difficult to obtain, it is a good plan to encourage the growth of gill sprouts, and to plant them out in nursery whilst small, and, when large enough, to remove the plants to their permanent position.

No matter what part of the plant is used for propagating, it is of the greatest importance that the parent plant shall be thoroughly healthy and of a vigorous constitution; thus scions should only be taken from plants that have proved to be good bearers of first-class fruit, instead of obtaining them from the cheapest and most convenient source; which is, in many instances, an old worn-out plantation which is being uprooted.

I am satisfied that the deterioration in some of our plantations is largely due to the fact that sufficient care has not been taken to keep up the standard of quality, and also the stamina and productiveness of the plants from which scions have been taken to set out new plantations, and I feel certain that if our growers would take the trouble to carefully select the scions from the very best plants, and carefully cull out and reject all inferior plants, we would very soon see a marked improvement in the quality of our fruit, and hear far less about the so-called pineapple disease. Never plant a sucker from a pine that produces cripples—viz., malformed pines—as the sucker will probably produce cripples also. Suckers of crippled pines can usually be detected by a dark line running through the leaf lengthwise, plainly visible on the under side of the leaf; and such suckers should always be rejected. The importance of improvement by natural selections is fully recognised in the growth of grain, vegetables, flowers, and fruits generally, and I see no reason if it is carried out carefully and systematically in the case of pineapples, why we cannot greatly improve them both in constitution, productiveness, and quality. At any rate, it is a matter well worth careful consideration, and is in my opinion, much more likely to lead to success than attempting to raise new varieties from seed. The varieties we are growing are the best obtainable, and even were we to import a quantity of plants from elsewhere, I doubt very much if we would obtain any of better quality, though it is extremely probable that we would obtain plants with a more vigorous constitution.

PLANTING.

Prior to planting, the lower leaves on the suckers should be pulled off, so as to give the young roots a chance to start. It is also advisable to cut off the hard base of the sucker just under the rootlets. If the bottom leaves are not removed, the young roots are apt to become matted, and the plant in consequence makes a poor growth. This condition of the roots is termed "tangle-root" by the Florida growers, and the removal of the lower leaves is recommended as a remedy.

Many of our growers cut the leaves of the suckers prior to planting, but in my opinion this is a mistake, as the leaves bleed when cut, and the cut surface tends to dry up the plant. The less the leaves of pineapples are cut about or bruised the better, and in this opinion authorities in all pineapple-producing countries agree.

When planting gill sprouts, the bulb or miniature pine at the base of the sprout should be broken off and the lower leaves removed, as in the case of suckers. If the bulb is left on it will rot and injure the plant. Do not set the plants too deep, as soil must on no account get into the heart of the plant or it will destroy it. Sanding up—as the filling up of the heart of the plant is termed—has to be carefully guarded against, especially when the soil is of a loose, sandy nature.

In this State there are several methods of setting out plantations, all of which have strong supporters, and, taking everything into consideration, it is a very difficult matter to state definitely which is the best. I, therefore, think I cannot do better than describe the various methods of laying out the land that are in vogue here, and to compare them with those in vogue in other pineapple-producing countries.

1st.—Planting in Single Rows.

This is the method most commonly adopted in all the older pineapple-growing districts. The land should be prepared as previously described, and the suckers are planted in rows usually 9 feet apart and at distances varying from 1 to 2 feet apart in the row.

The distance apart in the row is a matter on which growers are by no means unanimous, some strongly advocating close planting and others comparatively wide planting. Those who advocate close planting claim that a quicker return is obtained thereby, that the plants close up quicker in the row, and thus do away with the necessity for hand weeding between the plants. On the other hand, those who plant at the greater distance apart claim that they got stronger and healthier plants that will grow good suckers or ratoons that will produce the best fruit. Planting in rows 9 feet apart, with 1 foot between the plants, takes 4,840 plants to set out an acre, whereas when planted 9 feet by 2 feet only half the quantity—viz., 2,420 are required.

Planting can be done in several ways, provided that the land is well worked previous to planting, the simplest method being to take out a furrow with a plough, set the plants in it at the desired distance apart and cover. A Planet Jr. horse-hoe can also be used, the two moulding-boards being brought close together and the implement used as a listing plough. If artificial manure is desired to be added at time of planting, it can be placed in the bottom of the furrow so formed, and it can be well mixed with the soil by running a Planet Jr. with two or three narrow short teeth through the drill. The plants are set in the centre of the drill, and covered with the Planet Jr., with the two moulding-boards raised so as to throw the earth to instead of from the centre. In planting take care to keep any dirt from getting into the heart of the plant, and don't set too deep, 5 to 6 inches being enough for strong suckers and less for weak ones or gill sprouts. In sandy loamy soil that is well worked prior to planting it is not necessary to open a furrow, a line can be stretched along the ground and the suckers can be thrust into the soil by hand and firmed by the pressure of the foot.

When planted in single rows the space between the rows must be kept well cultivated, and it is a common practice to grow crops of tomatoes or early cucumbers between the rows, thus utilising the ground till the pines have extended to such a degree that they occupy the whole of the ground.

2nd.—Planting in Double Rows.

This method of planting is advocated by some growers and condemned by others, and is used both for smooth and rough leaved varieties. The two rows are usually some 18 to 20 inches apart, and the suckers are set at from 18 to 24 inches apart in the row. The distance from double row to double row is usually 9 feet. The plants in the two rows are not set out opposite each other, but those in the second row are set midway between those of the first row, thus giving each individual plant more room and at the same time more fully occupying the ground. Growers who favour this method of planting claim that the plants stand up better, as they are supported by adjacent plants, and consequently not so likely to become top heavy and tumble over as when planted in single rows. This is a consideration of importance, particularly in the case of smooth-leaved pines, which grow well out of the ground; as when the plant tumbles or leans over, the side of the fruit becomes fully exposed to the direct rays of the sun, with the result that scalding or sunburn takes place. The drawback to this method of planting is said to be the difficulty in weeding for the first couple of years, as after that, the plants should have closed up and occupied the whole of the ground between the rows. As in the case of single row planting, the rows eventually widen out till they occupy the whole of the land; in the meantime crops are grown between the rows.

Planting in single or double rows some 9 feet apart is the usual method adopted in this State, though I have come across a few instances when the rows have been much closer together and the plants further apart in the rows, no secondary crops being grown between the pines. This method of planting is, however, by no means common, nor is there any regular system in the planting—such as given distances between the rows or the plants in the row: in fact, the only well defined methods of planting adopted in this State are the single and double row systems that I have described.

I have given this question of laying out the land considerable attention since I have been in this State, and I fail to see the reason why we plant in the manner we do. As far as I know personally and as the result of numerous inquiries, I cannot find any other pineapple-producing country that lays off the land and plants the pines in the same way as we do in this State; so that there must be strong reasons why other pineapple-growing countries have adopted such an entirely different method of laying off the land to that in vogue in this State.

In Florida, U.S.A., where the culture of pineapples is carried out in the most up-to-date manner, the method of laying off the land as described by Messrs. Webber and Rolfs of the U. S. Department of Agriculture consists of laying off the ground in lands of from 15 to as much as 60 feet wide and laying off each land in checks, the favourite distances being 18 by 18 inches to 22 by 22 inches for the smaller varieties, 22 by 22 inches to 30 by 30 inches for the medium sized varieties, and from 30 by 30 inches to 48 by 48 inches for the largest growing kinds. The plants are not always set out in squares, as the distance between the rows is sometimes greater than the distance apart in the row. A favourite distance for Red Spanish is 18 by 22 inches, and for Smooth Cayenne 20 by 30 inches. Florida experience points to close planting rather than wide planting, and the tendency is towards closer planting as the plants then support each other, and as they soon occupy the whole of the ground they keep down weed growth. Mr. Rolfs states "Planting in beds about 15 feet wide has been practised for a considerable time and is gaining in favour. This allows the labourers to use the scuffle hoe without going between the plants, and also to apply the fertiliser by merely stepping among the plants of the first two rows. It is always necessary to exercise the greatest care in order to avoid breaking the leaves."

The Florida method of laying off the land is the one usually adopted in most pineapple-growing countries, the distance between the plants in the row and the distance between the rows varying somewhat in different countries according to the variety of pine grown and the nature of the soil—but in all cases there is this one essential distinction between this planting and that of Queensland—viz., that the whole of the ground other than the pathways required for gathering the fruit is occupied at once: whereas here it is many years before the rows fill up, and the most is made of the land.

In order to compare these methods properly, I will give a short list of the advantages and disadvantages of each, so that intending growers can use their own discretion in the matter.

Queensland methods of laying off the land—viz., planting in single and double rows.

The advantages of these methods, which, for the purpose of comparison, may be considered as one, are—

1st—Cheapness of cultivation. Practically the whole of the cultivation can be done by horse-power, as the distance between the rows allows ample room for the use of the plough and cultivator for some years.

2nd—Ease with which the fruit can be gathered. For the first five years all the fruit can be reached from the spaces between the rows without treading between the plants—and even when the plants occupy the whole of the ground the greater part of the crop can be easily gathered.

3rd—As the cultivation is always towards, and not from, the rows of pines, the space between the rows becomes lowered, and hence acts as a surface drain that carries off a large amount of water during heavy storms.

4th—The land between the rows can be utilised for the growth of secondary crops, such as cucumbers and tomatoes.

The disadvantages are—

1st—The plants do not occupy the ground to the best advantages. If plants can be grown successfully at distances from 1 to 2 feet apart in the row, why is it necessary to have 9 feet between the rows? That is to say, when the plants are 2 feet apart in the row, and 9 feet apart from row to row, each plant takes up 18 square feet of ground, which certainly is not necessary, as if the roots of the plants are not crowded in the row when the distance between the plants in the row is 2 feet, then there is no reason why the rows should not be 2 feet instead of 9 feet apart, and each individual plant occupy 4 square feet instead of 18 square feet.

2nd—The absence of any side support to the plants in the row, hence strong-growing varieties are easily blown over.

3rd—As the rows extend laterally by means of ratoons, the root system becomes a purely surface system and the ratoon plants grow out of and have only a very poor hold of the ground, despite all the earthing up that is done. This is seen when a plantation is being dug up: the original plants have a good root system which is usually well down into the soil, whereas the side ratoons have mostly surface roots and a poor hold.

4th—The rows soon become crowded and if not kept well thinned out the quality of the fruit rapidly deteriorates in the centre of the row. The best fruit is always seen on the outer plants of the row.

5th—The difficulty of manuring the centre of the row when it has become several feet in width, necessitating the severe cutting back of the plants before the manure can be applied.

The Florida system of laying off the land.

The advantages of this system are as follows:—

1st—Each plant has sufficient room for the proper development of its root system; hence it is better able to resist a dry spell. Surface cultivation by means of the Dutch hoe can be kept up round each plant.

2nd—Each plant helps to support the other, consequently there is little if any falling over, and sunscalding is prevented.

3rd—A much larger number of plants being set out, a larger and quicker return is obtained from a given area.

4th—There is a larger percentage of first quality fruit; as each plant has sufficient room to develop properly.

5th—The ground is kept level, only the surface being kept worked so as to prevent caking and keep down weed growth.

6th—When close planting is carried out the plants soon occupy the whole of the ground and weeds are thus prevented from growing.

The disadvantages are—

1st—A very much larger number of plants is required to set out a given area, consequently the initial expense is much greater.

2nd—Horse cultivation is out of the question, the whole of the work having to be done by hand.

3rd—No other crops can be grown as the whole of the land is required for the pines.

4th—The plants require frequent and systematic thinning to prevent overcrowding.

5th—The fruit is more difficult to gather, especially in the case of the rough-leaved varieties.

Planting in checks has not been carried out to any extent in this State, but when it has been tried the results have been very satisfactory with smooth-leaved pines, and, in my opinion, where the soil is suitable—viz., a free sandy loam well worked, it is the best way to plant this variety. As to rough-leaved varieties I am not so certain, still where tried I have noted that the plants make a better growth and produce larger fruit than when over-crowded in a solid row. At any rate this method of planting is well worth testing in the case of rough-leaved pines, and is to be strongly recommended for smooth-leaved pines.

In most parts of the State planting can be carried out at any time that plants can be obtained. Planting during September and October is usually preferred, as if there is sufficient moisture in the soil the plants root quickly, and as the soil and air are steadily getting warmer there is no check in the growth, which is well maintained all through the summer, and the plants are consequently thoroughly established before winter. Autumn planting is preferred by some growers, as well-ripened suckers can usually be obtained then, and little injury is done to the plantation by their removal at this time of year. Too late planting is not advisable, as the plants do not become well established before winter, and consequently only make a poor growth in spring.

VICTORIAN BUTTER.

The excellence of Australian butter has been well exemplified in the case of the Euroa (Vic.) butter factory. *Station Farm and Dairy* says:—The Euroa butter factory has reason to feel proud of itself. A consignment of butter put up in 1-lb. tins by the Euroa Butter Factory Company in November, 1901, and sent as ordinary cargo to Paoning, one of the districts of China, 2,300 miles inland from Shanghai, reached its destination in such excellent condition that one of the tins was returned unopen to Melbourne, and came to hand on 24th December last, having thus been carried about without special care for fourteen months. The tin was opened yesterday in the presence of Mr. R. Crowe, Government Dairy Expert, and found to be excellent in texture and condition, though, of course, the quality was not as good as that of the butter just made.

Viticulture.

TABLE GRAPES AND THEIR CULTIVATION.

By E. H. RAINFORD, Government Viticulturist.

(Paper read before the Horticultural Society of Queensland, 21st January, 1903.)

I have been requested to prepare a paper on grape cultivation, and I have taken this branch of the industry as my subject, for the reason that not only is the successful raising of table grapes a matter of more popular interest than the production of wine grapes, and the preparation of wine from them, but also because the latter subject could not be condensed within the limit of a single paper without doing injustice to so important a branch of viticulture.

Table grapes were, in all probability, first cultivated by neo-lithic man, who, having encountered in his hunting excursions a larger and less than usual sour grape on some wild vine in the forest, planted a few round his semi-detached cave that he might be able to regale himself with their fruit without searching for it far and wide. We can picture him seated at his cave's entrance, the skull of his last-killed tribal enemy gracing an occasional table of basalt, one hand toying with the woolly locks of his boomerang-shinned hairy better half, the other cramming into his well fanged capacious jaws the acid harvest of his beloved vine. A welcome zest to the eternal semi-raw monkey, or underdone chunks of horse which formed his usual menu. We may well believe that the gratification given by this Nature's Worcester sauce led to some sort of care for the plant that produced it. Probably the efforts to restrain its climbing too high led to a kind of primitive pruning; the refuse of the ménage would serve as a neo-lithic manuring, so that little by little the grapes would increase in size, consistency and sweetness, and eventually become objects of barter for wolf chops and other delicacies. All this, however, is conjecture. The first table grapes mentioned in history are those planted by Noah, and indubitably they must have been the Isabella, as no other vine could have flourished in such damp surroundings. It is pleasant to know that the vine so beloved of Queenslanders had such a distinguished ancestor. The vine must have made enormous strides in improvement in those ancient times, for when Moses sent out his spies into Canaan they returned with a bunch of grapes that required two men to carry it. This variety has to our unending regret become extinct, for the largest bunch of modern times weighed but 25 lb. 5 oz. 6 drms, and no scruples; this must have been, I think, grown in America. The paintings on ancient Egyptian monuments prove that the vine was highly cultivated on a kind of over-head trellis, and had relatively large bunches, the grape must then have been an agricultural product of considerable importance. And so, through Greek, Roman, and Mediæval times, the vine has descended to us ever improving in quality, the number of varieties ever increasing, until at the present time there are upwards of 2,000 distinct varieties in the Luxemburg collection, and there exist hundreds of others in the East, practically unknown to Europe.

I will now deal with the methods and procedure to be adopted by vignerons for the successful raising of table grapes. The first point I will touch upon is that of climate, that is, the general conditions of climate suitable for grapes, for to enter into the mysteries of the influence of climate upon organisms is beyond the power of man. In the Northern Hemisphere vines flourish in those localities where the mean annual temperature ranges between 55 degrees and 75 degrees Fahr. The latter limit is exceptional and only found in Northern India and China. In some localities vines do well, although the mean annual temperature is less than 55 degrees. If the same limits hold

good in the Southern Hemisphere they would include the North Island of New Zealand on the one hand, and North Queensland on the other, which is practically the case. The longer the winter rest, the healthier will be the vines, and consequently the heavier their crop; where the winter is short and mild, vines do not get sufficient rest, and poor crops of unequally ripened grapes are the result, as may be seen in the Northern districts of this State.

All the southern part of Queensland, except the extreme west, is well adapted for viticulture, and will produce heavy crops of all varieties of grapes on suitable soils. There is, however, a considerable difference between the climatic conditions of the coast districts and those behind the ranges. As the distance from the coast increases, the normal humidity of the atmosphere decreases, whereas, on the coast the air is not infrequently almost saturated with moisture. This atmospheric humidity is, amongst other things, a prime factor in the propagation of fungus diseases of the vine, consequently the varieties susceptible to those diseases cannot be satisfactorily grown there, which is an important point to be attended to when making a selection of vines for cultivation in those districts. The question of rainfall is another matter to be considered: this may appear to smack of sarcasm under past experiences, but so long as we continue to hope that there will be rainy seasons in Queensland some time or another, so must we take this factor into account when dealing with the subject. It is advisable to avoid planting those varieties which would, in the ordinary course of events, just be ripening when the rainy season commences. A selection should be made which either are very early or very late ripeners for coastal districts, and mediums and late ripeners for the Downs. A grape at the point of ripening is very easily attacked by grape rot under the combined influence of heat and moisture; it is much more resistant when unripe or green. For the same reason, varieties with loose bunches should be preferred to those that have the berries tightly packed, when a choice is possible.

SOIL.—The vine requires a well-drained soil if it is to thrive; any stagnant moisture about the roots causes sickness and debility, with consequent attacks of fungus diseases and other ailments. Sandy loams, gravels, and alluvials are the soils vines thrive in best; they do fairly well in porous clays, but in sticky clays or light soils with rocky or heavy clay bottoms they do badly.

Granitic, sandy soil is good, if not overlying pipeclay, which it frequently does. Soils derived from limestone rocks are generally excellent for the vine, especially for wine grapes, as are those derived from sandstone formations. The heavy chocolate and black soils derived from basaltic rocks, so frequently met with in Queensland, are suitable for some varieties, but they have an imperfect drainage, especially in wet seasons, which causes considerable coulure and disease in the finer varieties. The addition of lime greatly improves the physical qualities of these soils. There are large areas in Queensland of sandy ridges of a more or less bright red colour, especially their subsoils. Some of these ridges are excellent for the vine and some are quite useless. As illustrating the danger of choosing soils for the vine upon their chemical analysis, I will relate an experience of my own. I purchased a small block of this class of soil near Sunnybank, on the South Coast line, with the object of making there a little experimental vineyard for myself. The soil was a sandy loam of great depth, and apparently adapted for vine cultivation. At Chinchilla there is a considerable area of very similar class of soil, and, at that time, there was some idea of establishing there a State experimental vineyard. I took, with all the necessary care, samples of these two soils, and had them analysed at Gatton College, with the following result:—

	Sunnybank.				Chinchilla.	
Nitrogen	·06	...	·06
Phosphoric acid	·05	...	·06
Potash	·05	...	·08
Iron and alumina	5·93	...	4·27
Lime	·12	...	·13

These two soils are the same in nitrogen, and practically the same in phosphoric acid and lime; the Chinchilla soil a little better in potash, the Sunnybank a little higher in iron and alumina; but for all practical purposes the soils are the same so far as analysis reveals. Now, as to the results of cultivation on them: At Chinchilla, on the soil of which the analysis is given, were growing fruit trees, vines, and maize, in a vigorous healthy condition. On the Sunnybank soil I could get nothing to grow. I tried about fifteen varieties of vines—American and European—which were all failures, the shoots being weak and spindly; a few fruit trees did no better. A little maize put in as a test grew about 6 inches; and then made a mournful attempt at flowering. As the slight difference in potash will not account for the wide difference in the vegetation of the two soils, and there was no alkali present in the Sunnybank soil, it remains a profound mystery to me. I confess my inability to understand the difference in the cropping powers of these two soils, having so similar an analysis. There was one point about the two soils, however, that I failed at first to sufficiently estimate, and it was this: One soil grew the white gum, the other the apple-tree. My advice then is to look to the natural vegetation on the soil when choosing it for vines, and not to its chemical analysis. That will be useful afterwards when the time for manuring arises.

There is another class of red soil which is very uncertain as to its adaptability for vines. I allude to the red soils of Redland Bay and other places along the coast as far as Bundaberg. For the most part they are very fertile, for an analysis of a forest soil of Redland Bay shows that it contains:—

			Redland Bay.			Westbrook.
Nitrogen	...	...	·22	...	...	·126
Phosphoric acid	...	...	·07	...	...	·281
Lime	...	...	·53	...	...	1·175
Potash...	...	...	·60	...	...	·209

and this is a fairly representative soil of the class mentioned. An analysis of Westbrook soil on which vines do splendidly is also given for the sake of comparison. Yet on nearly all of them but few varieties of vines do well, and those mostly Americans; other kinds only just exist. The vine does not benefit by the elements of fertility, because it is unable, apparently, to dissociate them from some combination which the banana and pineapple find no difficulty in doing. At least, that is my view of the matter, but I invite the experiences of those present who have grown vines on these soils, which might lead to a better explanation.

I have always regretted that the Department of Agriculture has no experimental plot of this class of land. The future of the table-grape industry will be on the coast, and experimental work in these soils would be of considerable benefit to it. It is quite possible that the growing and ploughing in of leguminous and fodder plants might render the plant food of these soils assimilable for all varieties of vines. An experimental plot would also help us to decide upon the resistant power to disease of many fine varieties of table grapes introduced from Europe through the Department of Agriculture. If some gentlemen present who possess this class of soil would kindly assist me in making some experiments, I will with pleasure distribute to them cuttings for planting of many varieties which would be valuable for market purposes with which to test the soil.

Rich soils, especially scrub and deep alluvials have a tendency to develop foliage to the detriment of fruit, unless a system of pruning is adopted to meet it; even then the foliage becomes very dense. If the rainfall permits, the rows should be approached which will reduce the vegetation on the vines. Vineyards on creek alluvials frequently suffer from attacks of fungus diseases, although the soil may be porous and well-drained. This arises from condensation of moisture on the vines, in the shape of heavy dews by the cold air which collects round creek beds. For the same reason these localities are subject to spring frosts, which do considerable damage. Some people have the idea that

the poorest soils should be chosen for vines, which is a great mistake; for vines to be healthy and maintain a regular crop they must have a moderately rich soil or be frequently manured. One selector informed me that he would plant vines on the poorest soil he could find. My suggestion that he should plant a 10-acre grass-tree paddock, using the grass-tree for stakes, did not, however, meet with ready acceptance; perhaps he considered the soil too rich.

The preparation of the soil is a matter requiring notice, as some erroneous ideas appear to be prevalent on this point. I have frequently heard trenching described as digging a trench 2 feet to 2 feet 6 inches deep, and planting the vines in it, the same arrangement being repeated for the next row. Under such conditions the vines, in a heavy soil, would be standing in a permanent wet ditch, and must inevitably succumb to disease and root rot. If trenching is practised the whole of the ground to be planted must be turned up to a uniform depth, so that water can nowhere collect in one spot. Trenching is a costly operation, and the results rarely justify the expenditure except when done on a small scale. If the soil is well broken up to a depth of 12 inches by two ploughings, or by forking, vines will do very well. The great point is to have it done early that the soil may sweeten well before planting. It is advantageous to put in a cereal crop the year before planting vines if it is possible to do so.

VARIETIES.—The varieties I should recommend for planting depend upon the district they are to be grown in, and also whether they are to be cultivated as a source of profit or only for personal requirements. It is obvious that far more care and attention can be given to a few choice vines in a garden than to several thousands in a vineyard. For southern districts, as far as Rockhampton, I would recommend the following for commercial purposes:—Chasselas d'Ore or Sweetwater, Precoce de Courtilier, Madeleine Angevine, Madeleine Royal, Luglienga, all early white varieties. Chasselas Negrepont, Blue Portuguese, B. Hamburg, early coloured varieties. The Precoce de Courtilier is a new importation from France, being of the Chasselas blood, and a little earlier. The Madeleines are well known early varieties. The Luglienga is known in England as the early white Malvasia, probably so called because it does not in the least resemble any of the Malvasia tribe. Unfortunately I have been unable to procure any cuttings of this variety, but have some seedlings at Westbrook which have not yet fruited. The Chasselas Negrepont is a pretty rose-coloured variety of the Sweetwater. The Blue Portuguese is a very early black grape from Austria (another misnomer), but as it suffers considerably from attacks of anthracnose it could only be grown in gardens. A pretty ornamental early grape I can recommend to amateurs is the Violet Chasselas which has the peculiarity of the young berries turning a deep violet colour until the approach of maturity, when the colour changes to light rose. It is very prolific, and a vine covered with the violet-coloured bunches has a very pretty appearance. For later varieties I would recommend Mrs. Pince Muscat, Muscat Hamburg, Muscat Beaumé, Roussette, Golden Champion, Bermestia, Gros Guillaume, Wortley Hall, &c. All these are of fine quality and easily kept free from disease. Mrs. Pince in particular I would recommend as a grape worthy of the attention of both amateurs and vignerons. Its resistance to disease, seeing it to be a Muscat, is simply wonderful. I have found it growing at Bundaberg without a sign of anthracnose, bearing a heavy crop of fine handsome bunches, with large round black berries finely flavoured. It greatly resembles Muscat Hamburg except the fruit. The leaf is slightly darker in colour and it has a little less down on the under-side of the leaf, but the two vines can very easily be mistaken. Roussette and Bermestia are handsome oval grapes, golden in colour and prolific—two of the new importations. Gros Guillaume, a late variety of great vigour, with enormous bunches if carefully pruned. Showy varieties are White Table B. Prince, W. Morillion, but these are more or less subject to anthracnose. Gros Colman is subject to splitting.

The foregoing are all European varieties. I will now mention a few American. The principal merit of this class of grape is their resistance to disease, but the smallness of their bunches and the peculiar sliminess of the pulp of some kinds are, to my mind, serious defects, which rank them far below European grapes. The most meritorious obtainable in Queensland are Concord, Delaware, Wilder, Goethe, Iona, Alvey, F. de Lesseps, and a so-called Wantage. This latter I can highly recommend as a handsome, large-bunched, disease-resisting grape. It is not the true Wantage, but is, in all probability, either Beauty or Brilliant, but I am not sufficiently experienced in American varieties to say positively. There are about a dozen vines of this variety at the experimental farms. Concord is a good all-round grape, and very popular in the States. F. de Lesseps is a white grape of excellent flavour, but, unfortunately, subject to black-spot.

For a small number of vines in a garden or small orchard I could recommend some choice varieties, in addition to the above, provided that the proper care and attention be given to them to keep them as free as possible from disease, viz., Raison de Dames, the most beautiful of white grapes, Madresfield Court, Canon Hall, Calabrese, Cinsaut, a newly imported variety, oval, and purple in colour, and Malvoisie de Sitzes, a very large-bunched Spanish Malvoisie. Two magnificent white and purple grapes are the Muscat of Alexandria and Henab Turki, but both, unfortunately, a prey to anthracnose.

There are at the Westbrook Experimental Farm a number of newly imported French and Italian varieties, and also about 1 acre of seedlings I have raised from seed sent me from countries bordering on the Mediterranean. I trust to be able to report upon them in a future paper, giving a description of the grapes, their merits, and disease resistance.

Having mentioned a few of the varieties which can be profitably cultivated by vignerons, I will now touch upon the cultivation and management of vines. I strongly advise those who grow grapes for either pleasure or profit to practise deep cultivation from the first, especially on the coast. It is the mistaken system of shallow cultivation which is, to a great extent, answerable for the late vegetation of vines. Every shower of rain in the autumn, followed by hot sunshine, promotes absorption of and circulation of sap by the surface roots with a consequent production of leaf. It follows that the vine has too little rest during the short winter, and reduced yield of fruit, liability to disease, and other troubles are the consequence. I advise cultivation to a depth of not less than 6 inches, either by plough or fork, and removal of surface roots from the young vines. By doing so the main roots will be kept down below the cultivation depth, and not stimulated to action by every shower of rain.

PRUNING.—It is not my intention to enter into a detailed description of the various systems of pruning for vines, as to do so would be to extend this paper to an inordinate length. I will confine myself to emphasising a few primary rules a vigneron must follow if he wishes to have full and regular crops without distressing and weakening the vine. In the first place the crop must be subordinated to the vigour of the plant, for an overtaxed vine will in a very few years break down and prematurely decline in the same way that a cruel or thoughtless rider may injure a willing horse. So long as the canes are vigorous, and the stock sends out suckers and water shoots, it may be taken that the vine is not being overtaxed, and a spur or two may be lengthened according to the vigneron's judgment, but when the canes begin to weaken and make spindly growth it is a sign that the vine is being overtaxed, and the production of fruit must be diminished either by lessening the number of spurs or the number of buds on the spurs. Do not be misled by the crop on the vine; it is a characteristic of this plant to throw out much fruit when declining. Vines attacked by phylloxera invariably bear the heaviest crop the year before they are killed.

Another important rule is to keep all the permanent fruit-bearing wood at one level, for if that is not done the sap will inevitably make its way in

greater quantity to the spurs at the highest points to the detriment of the lower spurs, which diminish in vigour. Nine times out of ten vignerons who trellis their vines make the mistake of running the permanent wood over all the wires instead of keeping it down on the bottom wire. If it is desired to cover trellis with vines overhead as well as the sides, the work must be done by alternate vines—one for the sides and one for the top—one vine will not satisfactorily cover the two.

Another point that should be strictly attended to is to prune away all but one cane the year after planting. The practice of leaving both the canes growing from a cutting planted the previous year is answerable for the badly-shaped straggling vines so frequently met with. The later vines are pruned the later they will start, and conversely. Advantage may be taken of this in localities exposed to spring frosts to prune when the vine is in sap, which will retard the starting a week or ten days. The loss of sap is of little importance to the vine, as I have had it analysed and found it contained but a trace of nitrogen and other plant food. Some varieties bear better when pruned long, *i.e.*, the bearing wood being a temporary fruit branch which is removed at the next pruning and another laid down in its place. In this system it is absolutely necessary that a return spur be formed for each fruit branch to supply next year's wood; neglect to do so has landed many vignerons in a hopeless state of confusion and created a bad name for the system, whereas it is simplicity itself when correctly carried out. Muscat Hamburg do well with it, also Black Hamburg, Raisin de Dames, Zante currants, Sultanas, and several varieties of wine grapes. It can only be successfully practised on trellised vines.

Summer pruning is a not unimportant part of vine culture, which, unfortunately, is not always practised in a too rational a manner, universal close topping being especially indulged in. It may be taken as a rule that all shoots not bearing fruit, and not required for next season's pruning, should be removed as an encumbrance and drain on the vine. Exception should, however, be made in favour of well-placed water shoots at the base of old spurs, which should be carefully preserved for forming new spurs, as young wood invariably bears better fruit than old wood. Even the cordon upon which the spurs are situated can be renewed advantageously from a water shoot on the stock which is, the first year, pruned back to one or two eyes.

Concerning short topping I am its vigorous opponent unless cultural occupations absolutely require it, as in very vigorous bush-pruned vines. Two consecutive seasons I experimented on this point at the Westbrook State Farm, and both years the results were identical—*viz.*, the grapes from short-topped vines contained 2 per cent. less of saccharine matter and 2 per mille more acid than did the grapes from vines very slightly topped. There was also a marked deficiency in colour in the short-topped vines. Vines topped to 2 feet 6 inches in length occupied a position about half-way between the two. The theory that by removing part of the shoots the sap will be forced into the grapes is singularly incorrect. Sugar, starch, colouring matter, &c., are not extracted by the roots from the soil, but are manufactured in the leaves from the carbon in the atmosphere united to the oxygen and hydrogen of the water absorbed by the roots under the influence of light and heat; if the leaves are removed the sugar factory is partially destroyed and a reduced output results. With a heavy crop the results are obvious. If, again, there is such vigour of growth as to require persistent stopping the system of pruning adopted must be radically wrong.

PINCHING.—Unnecessary pinching is as injurious as unnecessary topping, but there are occasions when it may be practised with advantage. If the shoots on the first and last spurs of the vine make a rapid growth to the detriment of the other spurs, as they frequently do, they should be pinched back and checked to give the rest of the vegetation time to catch them up. It is of the first importance that all the vegetation on the vine should balance. Again, in the case of non-setting of the fruit, which is a defect of many varieties, pinching will assist the setting, but this will be dealt with further on.

TREATMENT OF DISEASE.—The fungus diseases which trouble the vigneron in Queensland are anthracnose, or black spot, and oidium. There are one or two others, but of little importance so far as their effects are concerned. Oidium is easily kept in hand by timely applications of powdered sulphur to the young shoots and bunches. I do not recommend the addition of lime or ashes to the sulphur early in the season, for the reason that the action on the fungus is due to its oxidation by air and the sun's rays, causing a production of acid fumes, which attack the fungus. When lime is added to the sulphur the oxidation of the latter must necessarily be decreased. The most injurious disease, and the most difficult to cope with, is anthracnose, and it is answerable for the loss every season of many tons of grapes. I have experimented with almost all the well-known fungicides, but with only partial success. Sprays of copper compounds, such as Bordeaux mixture, have a very uncertain action upon it, as I have proved at the experimental farms. Dusting the vines with sulphate of iron, lime, and sulphur is not much better, and it has to be replaced after every shower of rain and high wind. The most effective treatment as a palliative is, in my experience, winter dressings of sulphuric acid solution, and also a saturated solution of sulphate of copper. Much depends upon the care shown by the vigneron in the application of these dressings, and the time of doing so. The vine, stakes, posts, &c., are infested with the spores of the fungus, and upon the number of these deprived of life will depend whether the ensuing spring the attacks of disease will be severe or not. It is necessary, therefore, that every part of the vine should be carefully disinfected with the mixture. The most effective means of applying it is with an old spray pump, which should be washed out with fresh water after use. Walk down one side of the row and back again the other, so that both sides get well sprayed. If a brush or mop is used every square inch of the vine should be well wetted, especially the spurs. If the vines are few in number removal of the bark and burning it previously will assist the disinfection, but this is not practicable in a large vineyard. In the spring spraying with Bordeaux mixture or eau celeste, when the shoots are 3 or 4 inches long, can be tried; it can do no harm, and may possibly catch the escaped spores germinating, but all experience goes to prove that applications of copper compounds for anthracnose and oidium lead to very uncertain results. But if the grape-grower wishes to escape fungus diseases he must go to the root of the matter and see that his vines are living in thoroughly fit and healthy surroundings, for if not all the dressings and sprays ever invented will be but temporary palliatives. If vines are living in a soil more or less poor in plant-food, or if the physical conditions of the soil are such that moisture hangs about the roots instead of draining off quickly, they will inevitably be attacked by fungus diseases in the same way that scale attacks by preference sickly fruit trees. When for either of the above reasons a vine loses something of its good health and vigour the micelium of a germinating fungus spore finds easier entrance into the tissue of the plant than when it is under perfectly healthy conditions. I do not mean to say that no thoroughly healthy vine is attacked by disease, far from it, but in unhealthy plants the percentage of vines attacked and the virulence of the disease is enormously increased. Much of the fungus disease in Queensland is attributable to the humidity of the atmosphere; but I repeat, if vines are to resist anthracnose and oidium they must be planted in well-drained soil, and they must have a certain standard of fertility of the soil kept up by manuring when the natural fertility of the soil is insufficient or begins to decline.

For those who have a few choice vines which suffer from attacks of black spot I have a plan to recommend which will preserve their grapes from the disease. It must be understood that for spores of fungus diseases to germinate and penetrate the tissue of the young shoots moisture is required. This is furnished in the shape of dew or rain, also by a condensation of moisture from fogs. It is evident then that if a vine can be protected from rain or dew falling on them there is a great chance of its escaping disease attacks through those agencies. Arrange then over the young shoots of the

vine during their receptive period some protective covering such as an old box, matting, or similar material to be placed in position at sundown and removed in the morning or whenever rain is threatening. If vines are trained 'against the side of a house a few planks leaning against it will sufficiently cover them. If a little care on these lines is given them even the Gordo Blanco could be grown successfully in Brisbane. Condensation of moisture from fog is of course impossible to avoid; as it penetrates everywhere; when it happens prompt spraying with fungicides would be necessary to kill the germinating spores. Another way of preserving grapes from disease is to sack them, a system which could be advantageously carried out by amateurs and small orchardists desirous of raising choice varieties. The usual procedure is to introduce the clusters before flowering in the case of self-fertilising varieties, and after flowering when they are not self-fertilising into a bag either of manila or parchment paper sufficiently large to accommodate the bunch when fully grown. The edges of the bag are pinned together round the stalk, which prevents the entrance of disease germs as well as damage by insects and birds. At the same time, no precautions should be neglected to keep down disease on the vine itself, otherwise the following year there would be no bunches to sack.

It is worthy of note that most, if not all, vines with a smooth shining leaf surface are in Queensland liable to attacks of Anthracnose in damp surroundings. As examples I will mention the Crystal Boal or W. Portugal, Raisin de Dames, Calabrese, &c., when combined with a thin flabby leaf as in the Malagas and Monukka they are a perfect prey to it. This season there is very little disease as compared with other years, the reasons being that vines vegetated under very dry conditions of soil with a consequent toughening of the epidermis of the leaf and shoots which the micelium of the fungus was unable to penetrate.

Of other ailments and troubles to which vines are subject I will only mention one or two. First, injury by insects to buds, shoots, and fruit. This can be coped with by using sprays of insecticides, such as Paris green mixed with a little lime to avoid burning the leaves, and also a small amount of molasses to make it adhere. Wilting of the young shoots when they are a few inches long, which frequently occurs in an hour or two, is caused by an excess of evaporation of moisture from the leaf surface above that furnished by the roots on any especially hot day. It is almost invariably an indication of stagnant moisture in the soil, which causes sickness of the roots with inability to perform their functions satisfactorily when they are suddenly taxed. The wilting is more noticeable in some varieties than others, and is generally to be found in those which have a thin leaf without down. I have noticed this defect at the Westbrook Farm in the Mauzac and Morocco Prince, but not to any great extent. At Charters Towers the wilting was very considerable in a vineyard of Sweetwaters, Black Hamburgs, and Black Princes planted in a heavy black soil frequently irrigated from an abandoned mine.

Couleur or non-setting of grapes may arise from constitutional defect in vines, in which case they should be dug out or grafted; or it may be caused by climatic influences, such as cold, wet weather at flowering time, in which case there is no remedy. Again, couleur frequently occurs in vines which have a very vigorous growth, the complaint being caused by the rapid growth of the shoots absorbing all the sap to the detriment of the bunches. This class of couleur can be mitigated by severe pinching of the main shoots, and, again, of the laterals just before the flowers open. The time of operating is all important, as if effected a day too late the damage will be done. Pinching arrests the flow of sap to the extremities of the shoots and permits the flower bunches to absorb sufficient to nourish the nascent berries. The same effect is gained by practising the annular incision, a kind of ringbarking effected by a little instrument made for the purpose. Fungus attacks are also the cause of considerable non-setting. It follows, then, that measures taken to combat these diseases will assist in preventing this class of couleur.

Fumagine or smut is an unsightly defect which occasionally makes its appearance on vines. It is entirely attributable to the presence of scale on or

in the vicinity of the vines. If the scale is on surrounding or overhanging trees, spray or remove them. Scale on the vine is easily removed by the sulphuric acid winter dressing already described. Uneven ripening is a trouble met with more frequently in the Central and Northern districts than in the South. The causes may be—First: Constitutional, as in some Isabellas; eradication or grafting only will cure it. Secondly: Excessive crops; the cure for this is obvious. Thirdly: Exposure of the berries to the sun through excessive topping or training the vine on the top wire. The action of the cells in the berries become more or less paralysed by the sun's rays, and are therefore rendered incapable of performing their functions. Lastly: Constitutional weakness of the vine, caused by insufficient repose during the winter; this is frequently the case in the Northern districts, where the vine is in growth until the late autumn and again in July, and in these localities uneven ripening is very common.

If our Southern vignerons would pay attention to their pruning, avoid excessive topping, and remove any excess of crop, they should not be troubled with uneven ripening; if it occurs, then it is constitutional and irremediable.

There is one thing I should like to mention, and that is the necessity of selecting cuttings from the most fertile vines for reproduction. There is a want of care in this respect that is having an evil effect upon viticulture in Queensland. Vignerons when planting a vineyard appear to think that so long as they obtain cuttings of any description, they will do. The result is an increasing number of infertile vines, and also a depreciation of the quality of the fruit. I was much struck when I first came to this State by the large number of poor croppers in the vineyards, caused entirely by inattention to selecting canes from the best vines for planting. It is only by doing this that a high standard of quality can be kept up and improvements made. If our forefathers have bequeathed to us so many splendid varieties of wine and table grapes, raised entirely by careful cultivation and selection of the best, it is our duty, if possible, to improve upon them for transmission to posterity, certainly not to allow them to deteriorate, as so many are now doing. If every grape-grower would carefully note any sports or grapes of unusual size and quality on his vines, and plant the canes which bore them, many new and useful varieties would result. This system of selection has produced some of our finest varieties of table grapes.

GRAFTING.—It is not my intention to enter into a description of the various kinds of grafting practised by experts; for ordinary purposes, such as replacing an unsatisfactory or infertile variety with another, the usual method of grafting with the simple wedge graft is sufficiently easy for everyone to do with an hour's practice, and if the proper care is taken in the preservation of the scions and the fitting of the cambium layers in scion and subject a take of 90 per cent. may be looked for if the climatic conditions are favourable for a healthy union after the operation. My object in alluding to this matter is to obtain experiences of others with regard to the effect of grafting upon the quality and size of the fruit of the scion. Opinions vary considerably on this point, and my own experience up to the present is entirely negative. When considering this subject we must remember that the quality and size of the fruit may be improved or deteriorated by the simple factor of increased or diminished production. This is quite a different matter to improvement or the reverse by transmission of some of the characteristics of the stock through the union to the fruit of the scion. As an instance: Since the French replaced the vines killed by phylloxera with American resistant stocks, upon which were grafted their choice wine varieties, the production has, in some cases, so greatly increased, consequent upon the great vigour of the stocks, that the quality of the wine has decreased in proportion. This is easy to understand; the same effect is produced by allowing too much wood to a vine when it is pruned, whereby the crop is considerably increased. Conversely, if a vine is grafted upon a stock of little vigour the diminished crop of grapes would

produce a superior quality of wine. But in grafting two vines of similar vigour with sufficient affinity to secure a good union, has the stock any power to influence the quality of the grape? My experience is against the fact, and I should be glad to hear of any positive instance in favour of it.

Whenever I am considering about the table-grape industry of Queensland it is always a matter of wonder to me that our vignerons do not take advantage of the Queensland climate to grow early grapes for the Sydney market. There is a mine of wealth absolutely untouched; our men on the coast could send to Sydney early grapes, which would arrive in that market at least a fortnight before their own, obtaining very remunerative prices. Yet they are content with an acre or two to supply Brisbane only. It is really astonishing that fruitgrowers can be so blind to their own interests as to leave this branch of their industry unexploited. Bananas, pineapples, oranges, strawberries, but no grapes. From Southport to Bundaberg there is a field for this enterprise which would prove very remunerative if certain precautions were taken as to choice of varieties and preventive treatment for disease. I have seen vines at South Kolan, near Bundaberg, laden with large B. Muscat grapes quite ripe about the 20th of December, selling for about 6d. a lb. locally, and which would have brought three times that price in Sydney at a cost of about 1d. per lb. for expenses. The grape was Mrs. Pince, so far as I could judge, which is not an early grape and, although no special precautions had been taken against disease, they were absolutely free from it. Muscat Hamburgs, in the same district, were badly spotted. I relate this to prove that an enterprising man could, with a few acres of good soil planted with carefully chosen European varieties, make a little fortune out of the Sydney market if he was careful in his cultivation, and, above all, adopted an attractive system of packing. On this point the Queensland fruitgrower has much to learn, especially the grapegrower. Fruit of fine quality and appearance loses half its attractiveness when badly packed, and our finest grapes are invariably sent to market bundled into mouldy old apple cases lined with a dirty newspaper! A new case with a clean white or coloured paper lining might cost 4d. extra, which would in all probability be realised twice over in the better price obtained for nicely packed fruit. The eye governs us in all things, and a tastily packed case of grapes will find more purchasers than the same fruit badly packed.

A matter that requires the attention of all interested in viticulture is the incorrect nomenclature of vines which is so frequently met with in Queensland. I encounter in my travels more vines that are misnamed than those that are correctly so. Not only do mistakes arise when giving advice as to choice of varieties in wine-making, &c., but likewise with table grapes, which might have serious consequences. I have been shown Sweetwater grapes, which were Chasselas, Palomino, Mauzac, Burger, and other varieties. Muscats which were more like polecats. All the black varieties of Americans are called improved Isabellas. A Semillon is a Riesling at Roma, a Salvino at Toowoomba, and a Solferino elsewhere. If a vigneron does not know the name of a white grape he calls it "Sherry." I see grapes labelled Xeres in shop windows when no such grape exists. Throughout the Central districts Gros Colman is called "Morocco Prince," which is quite a different vine. Clairettes are called "Verdeilho," and the true Verdeilho is called "Madeira." I could continue the list indefinitely, but will not tax your patience further. If this society could take in hand revision of the mistaken nomenclature of grapes at present existing in Queensland, it would be doing a work that is urgently required.

I have now to thank this meeting for listening to me so patiently, and to apologise for the length of this paper and the dreariness of the matter, which must have wearied you. Should anyone present have reasons for dissenting from anything I have written I should be glad to hear them, as, so far from being one of the infallible brigade, I am a firm believer that no matter how long a man may have been engaged in a particular pursuit he can always learn something from the experiences of others.

Apiculture.

THE APIARY IN MARCH.

By H. R. STEPHENS, Toowoomba.

As the summer is practically over, beekeepers will be busy extracting and preparing their stocks for the cooler weather, which will soon be upon us. The yield of honey for the past season has (considering the absence of rain during 1902) been a fairly good one up here in Toowoomba, as we have had native apple-tree blooming well during November and December. Now is the time to beware of robbing, as the cessation of the honey flow makes an idle time for the bees, which they endeavour to lessen by an inspection of the other hives, hoping to find some crack or crevice unprotected. It is, therefore, a good idea to contract the entrances of hives which have been given the full width during the summer. Any cappings that may be given as feed to the bees should be put down a good way from the hives or fed inside in shallow trays that will lie on top of the frames. After the honey has been extracted, the supers should be stacked and covered so that mice and bee moths cannot get to them. An occasional examination of combs is also advisable, to see that they are not being interfered with. There should be sufficient honey left in the lower story to tide the bees over the winter. Division boards are sometimes used to condense the bees in brood nest and conserve warmth. They may be made to hang in hive the same as frames, and out of 1 or $\frac{7}{8}$ -inch board.

HONEY NOTES.

An English bee expert says:—

COLOUR OF HONEY.

Honey varies in colour from being clear almost as water to black. Primarily, the colour is determined by the kind of flower yielding the nectar. The light honey is obtained from the flowers of the cabbage tribe, fruit bloom, white and alsike clover, and sainfoin. Various flowers give a nectar decidedly dark, but the crops noted for producing really dark honey are buckwheat, grown principally in the fens, and heather on the moors.

The soil affects the colour very appreciably. Clover honey is generally in varying shades of amber, but if grown on chalk it is almost colourless, while being of superb flavour and of remarkable density. This is understandable, because owing to efficient drainage afforded by the chalk the plant is never very moist.

THE TASTE OF HONEY.

All honeys have more or less both flavour and aroma. The aroma may be lost by exposure, but not the flavour. The flavour may be spoilt, however, by heat. If we take a sample of honey with a scent of onion and cover it with muslin, the scent will almost wholly disappear. Aromatic herbs give a distinct flavour, as well as aroma; for instance the famous Narbonne owes its distinctive flavour to rosemary. Wild thyme, eucalyptus, orange blossom, too, give very special flavours, samples of which I have had for many years in screw-capped or corked jars.

Crops known to produce choice honey, if grown on good soil, with a sub-soil affording good drainage, will give excellent samples, providing the weather favours the secretion of nectar.

KEEPING HONEY.

Fortunately, honey is not very liable to get spoilt. Comb honey must be kept dry and free from the air by packing it in paper and storing it in a box. Liquid—that is run or extracted—honey, if quite ripe when taken from the combs, will keep almost indefinitely, if kept in air-tight jars or tins in a dry cupboard.

This class of honey will in time set, and so keep well. It is easily returned to a liquid condition if set in a pan of water on the fire and heated gradually. The melting-point of wax is 145 to 147 degrees Fahr., and though this degree of heat must be produced to separate the honey from the wax of comb honey that has candied, a much less degree of heat applied gradually will liquefy candied honey without causing it to deteriorate in quality.

Liquefy small quantities as required, and not the bulk, as it may recrystallise, and repeated heatings would certainly be detrimental.

BROAD V. NARROW TIRES.

Mr. H. H. Westenhall, Carr's Plains, Stawell, writes to the *Australasian*:—Noticing some comment by "R.D." on the broad v. narrow tires and experiments in America, I think it may be of interest and value to some of the readers of the *Australasian* to know some facts (equal to what you have shown as done in America), which are realised here. In the Richardson Valley, and near here, there are a number of farmers who all give the same opinion. Mr. E. Erwin, who has to cart his wheat 25 miles, used to take fifty to fifty-five bags on six horses with 3-inch tires; now he has 5-inch tires, and five horses to do the work (the same load). Mr. E. Evans, whose experience was practically the same, says, "The long and short of it is, it is a horse less." Our experience with a wagon and 3-inch tires was that it took five horses all their time to take forty bags of wheat to Stawell. Then we put 5-inch tires on these wheels, and the same team took fifty-five bags every trip. On this wagon we send loads of forty-four bales of wool, frequently weighing 6 tons 10 cwt. without horse feed or the driver, which would weigh 3 cwt. or more; and five horses do it easily, only having to exert themselves at the hills; the sand does not give them much trouble. This team went into Stawell (23 miles), and unloaded one day and out and loaded the next, for six weeks, never missing a day, except Sunday, and carted 726 bales, making the average load about 5 tons 15 cwt. It would be hard to over-estimate the value of these broad tires over narrow. As an instance of the effect on soft ground, our teams, a four horse and five horse, used to load up wheat out in the field 100 bags, and pull it out without double-banking. This so influenced several (who saw it done continuously) that they went in for them. Altogether, within a radius of 12 miles, there are more than ten of these broad tires, all adopted in the last six or seven years.

Tropical Industries.

THE JOHNSTONE RIVER DISTRICT—ITS CAPABILITIES AND PROSPECTS.

No. 2.

By J. E. HARDING.

MOURILYAN HARBOUR—THE PORT OF THE DISTRICT.

Pugh's Almanac, 1898, "Sailing Directions," say of this harbour: "Mourilyan Harbour, about 40 miles northward of Cardwell, is marked on the older charts as 'Shoal Haven,' 'Reported good Harbour,' and is situated in latitude 17 degrees 35 minutes south. The entrance between the headlands is less than one-eighth of a mile in width, while the available channel is narrowed by rocks to a width of 40 yards. . . . The available depth is 20 feet at low-water springs on line of beacon and light for a width of 35 feet; the minimum depth for 100 feet is 15 feet. After passing another, Perry rock, marked by small black buoy, on south side of the entrance, the channel widens out and forms a small basin, one-third of a mile east and west, and about one-sixth north and south, with a depth varying from 4 to 12 fathoms. It is well sheltered, and there is a good wharf on the north side, and a small, deep frontage on the south shore, near Camp Point. . . ."

The harbour is about 9 miles from Geraldton, 6 miles from Liverpool Creek, 12 from Maria Creek, 20 miles from the Russell River, and the Moresby empties into the port within 24 miles of four-fifths of the entire country mentioned in this article, and about 45 miles from Herberton. The ocean-going steamers sometimes come into the harbour and load sugar, and were two or three thousand pounds expended in removing some rocks at the entrance, it would be one of the finest harbours on the Queensland coast.

MEANS OF ACCESS—LIGHT RAILWAYS AND ROADS.

The level surface of this country renders it well adapted for the economical construction of light railways, of 2-foot gauge. Starting on the Russell River, the most distant point, no difficulties are met with, except a bridge across the Johnstone; the level nature of the country from river to river rendering construction easy; bridge the river, and level going to Geraldton is found; thence to Mourilyan Plantation, still even country; then *viâ* the Mourilyan Sugar Company's line to the harbour.

The Johnstone Divisional Board built a light line to the 17-Mile (three branch lines) distance between the two Johnstones. This line taps a vast amount of private land, and will cause a large increase of population. Another line, from the Maria, *viâ* Liverpool Creek, to the Harbour, would also run through level country the entire distance, and could be built at a minimum expense. None of these railways would cost more than from £700 to £1,000 per mile.

At present our roads in the wet season are bad, and as metal is unavailable, so they will continue. With a system of light railways to serve as main roads, and the by-roads made passable by having all rates spent on them, and gravelled from pits tapped by the railway, the district would be opened up, and with easy means of access to our undeveloped source of wealth—the land—population and progress would ensue. A permanent survey to the 17-mile peg has been completed for a 2-foot tramline. When funds are available this line will be built. This line now being built.

CLIMATE.

Rainfall.—This district, as the subjoined tables will show, is blest with the most copious rainfall in Australia—

Note.—A meteorological wet day is 0·006=six thousandth of an inch.

Year.	Inches.	Wet Days.	Year.	Inches.	Wet Days.
1896	154·23	151	1889	194·12	127
1895	128·200	143	1888	85·880	124
1894	211·240	184	1887	154·650	170
1893	111·140	101	1886	163·20	200
1892	134·12	136	1885	145·72	202
1891	193·97	158	1884	123·02	163
1890	145·30	168	1883	118·71	162

As to some readers the number of wet days may appear excessive, I will compare the Johnstone record with Southport—a popular holiday and health resort—and also with seven stations representing the United Kingdom of England and Wales:—

Average number wet days per annum for 15 years—

Southport	122½
Johnstone River	142

Average number wet days per annum for 16 years—

England	189
Eastern countries	185
Midland counties... ..	180
Southern counties	176
North-western, including North Wales	197
South-western counties, including South Wales	200
Channel Islands	213

A table showing monthly analysis of rainfall, Johnstone River, during the year 1896—

Month.	Inches.	Wet Days.	Month.	Inches.	Wet Days.
January	20·400	24	July	1·110	6
February	29·920	22	August	6·440	12
March	41·140	20	September	2·970	10
April	34·650	20	October	0·590	3
May	7·20	14	November	6·140	10
June	1·270	8	December	3·620	10

From these tables it will be seen, though the district is in receipt of a regular and bountiful rainfall, that sunny skies and fine weather for harvesting crops are also available. From July to January the weather is all that can be desired, from a personal point of view; cool and breezy, with clear skies; at night quite chilly. That this district is a land of streaming rain, leaden skies, and everlasting mud is only a traveller's lie; the indignation of residents at wet weather out of the rainy season is proof of the regularity of the weather. The chief difference in rainfall is it is heavier on the Johnstone than most other places; a wet day on which 3 inches falls in twenty-four hours is no wetter to work or travel in than one on which 2 inches falls in the twenty-four hours. One advantage tropical rain has, it is distinctly warm, so that a man can be out for hours and not get chilled, as in the South. The destructive hailstorms of other districts are an item the farmer will not be sorry to miss in this, as hail is unknown.

Temperatures.—

Minimum at night, winter,	38 degrees Fah.	} Shade temperatures for 12 years.
Maximum at noon, summer,	105 ,,	
Summer heat, midday	... 85 to 95 degrees in the shade.	
Winter heat, midday	... 70 to 80 ,, "	
Summer, 10 p.m....	... 70 to 80 degrees.	
Winter, 10 p.m. ...	... 40 to 60 degrees.	

As is usual in tropical countries, from 9 to 11 o'clock is generally the most trying part of the day, as the still morning air, laden with evaporating dew, is not yet stirred by the fresh sea breeze that comes regularly at from 10 to 11 o'clock and blows till sundown, when it dies away, and the cool land breeze creeps along from the Herberton tableland, rendering the nights delightfully cool.

PRESENT INDUSTRIES—AGRICULTURE.

Sugar.—This is the home of sugar-cane, no frost or drought, a rich, well-drained soil, and a powerful sun. It is of little value as information to state tonnage per acre, as so many factors may come in to deceive. For instance, a crop planted in May, 1897, goes, when cut in August, 1898, 40 tons per acre—40 tons of plant cane. Many writers would comfortably call this one season's growth, because the stalk shows no short joints, and it had only one summer to grow in. Therefore, I will not run off a list of heavy-weight crops, which in my opinion are only misleading to the inexperienced. An annual crop can be relied on on the Johnstone; planted as late as January, a cutting of ripe cane will be secured in December with careful cultivation and favourable weather conditions. I am of opinion that the annual yield, taken for a number of years, is fully one-third heavier, probably more, and the density averages higher, than in the South. Cane can be planted all the year round with success, and it has fully three months more growing weather than further south. From these statements any Southern cane-grower can see the difference between sugar production in this district and in his own.

Bananas.—Second in importance stands the production of this fruit. At present it is carried on by Chinese. The owners of land make an arrangement with the banana-grower to lease standing scrub land, usually rich alluvial flats on the river bank; the term is five years, rent from £1 to £2 per acre—first year rent free. The lessee to fell, clear, and plant crop, and at the end of the term relinquishing the clearing for a fresh piece of land. Chinese primitive methods lending themselves better to hoe culture than horse implements. There is no reason why white settlers should not grow bananas and make money. John Chinaman pays a high rent, lives well, works short hours, stumps up handsomely to "Joss" and the local hospital, clears and plants the land at a heavy expense, and then leaves it, just when a farmer would get to business. From 400 to 600 bunches per acre per annum is the yield, averaging about 1s. per bunch to the grower. A gospel is preached by some old fossils that when the land has grown bananas for five years it is played out. No notice is taken by these experts (?) that the Chinaman has only hoed the surface, or that there are some gardens on the river worked with the plough, and yielding splendid bananas after fifteen years' cropping. The writer could point to banana farms at Redland Bay and the Albert River that have grown bananas longer than that, from which the owners state £15 per acre is the average return. There are about 2,000 acres under bananas on the Johnstone.

Maize.—A story is told that maize will not mature on the Johnstone, yet it is grown on the river, and yields good crops; the thread of truth that runs through this fable is evidently founded on the fact, that maize, owing to the absence of protracted dry spells and frost, is often planted any month of the year, and also many persons without previous experience in maize-growing, and some that have experience, have planted their crop so that it matured in the wet season, or was cobbing too far into the dry months, and thus was a failure. We have not enough of the *genus* farmer here to give this astonishing

statement any weight. The Russell and Cairns, a few miles to the north, and the Tully, 50 miles south, yield good profitable crops, and we can beat either for soil and climate.

Coffee.—This industry is in the embryonic stage. There are some small areas under coffee on the Russell River and Alligator Creek, which promise exceedingly well, as high as 3 lb. of dried-bean coffee being taken from three-year-old bushes. All over the district, in almost every garden and old clearing, coffee is growing, and doing marvellously well; the deep, friable, perfectly drained, red and brown volcanic soils, being model coffee land. Both Arabian and Liberian flourish and thrive, as though indigenous to the district.

Citrus Fruits.—The orange luxuriates in the deep well-drained soils of the Johnstone; the trees are remarkably free from scale, blight, and die-back, fruit prolifically, and produce an orange, thin in the skin, small quantity of rag, juicy, and a sweet full flavour. Lisbon or Messina lemons are of a first-class quality; limes run wild and bear nearly all the year round. The Seville orange, for preserving purposes, does equally well.

OTHER CROPS.

Arrowroot (purple and St. Vincent varieties).—As with other tropical crops, this plant grows well, producing large quantities of bulbs, rich in starch. The dry winter months in which it matures, with the bountiful supply of pure, fresh water being all that is required of Nature in the manufacture.

Yams and Sweet Potatoes.—Sweet potatoes grow all the year round, the practice being to plant in successive patches; a crop will be usable in three months from date of planting. Yams require six months to mature, and grow vigorously, producing a full crop.

TEMPERATE AND SUB-TROPICAL CROPS.

English Potatoes, when planted with an eye to the best time of year—at the end of the wet season—generally produce a good crop, quite up to southern tonnage and quality.

All Garden Vegetables, such as cabbage, peas, carrots, turnips, &c., do first rate, the abundant rainfall sending them ahead, as would a well-applied watering-can in a Chinese garden.

Tomatoes.—As in the South, tomatoes run wild, and are always available for sale or the table.

Oats and Lucerne.—Both these crops are grown for home use, and, to all appearances, would pay to cultivate in larger areas for sale.

Sorghum and its kindred grow almost throughout the year, as the cold is not severe enough to check their growth.

Pumpkins and their kindred are equally prolific.

Rice.—Every Chinaman has his patch of this cereal, generally grown on the margin of swamps. There are large areas of land suitable for rice-growing. The heavy yield to be seen on these small patches on the river indicates the profit that there is in growing rice. Two tons per acre is commonly mentioned as the yield obtained in larger areas at Cairns.

LIVE STOCK.

Pigs.—The climatic conditions, abundant water, and the ease with which a large amount of cheap pig foods can be grown, coupled with the large area of fertile land, mark this district as one of the largest future pig-raising centres in Queensland.

Cattle and Horses.—Cattle soon fatten on the scrub paddocks of the district, and horses do as well as in the coast districts further south.

PESTS AND VERMIN.

One of the most striking peculiarities of this vast scrub (which proves continuity for exceptional distances) is the utter absence of wallabies and paddymelons. There are none of these pests in the scrub on the Johnstone. A scrub bandicoot in small numbers and a rat somewhat like the common warehouse rodent represent the furred vermin. The rat is a great nuisance, but can be poisoned easily.

Cockatoos.—The corn-grower will find his ancient enemy, the white cockatoo, in large numbers, just as they were in the early days in the Southern scrubs. Powder and shot put them off the frontage as of yore.

Magpies or Currawongs.—Not in large numbers.

Crows.—There are no crows.

The Cane Grub.—This grub is “the fly” in the sugar-growers “pot of ointment,” only the “pot” is so large that the grub, though causing serious loss, is a long way from disastrous. So far, the methods used to combat the pest have not done more than act as a check on its increase. Bad as it is, its ravages are not to be compared with the havoc wallabies commit on cane in other districts. This grub is not peculiar to this district, being found as far south as the Isis, and north as far as cane is grown.

Alligators.—Many people have lived on the river for years and have not seen one. All sorts and conditions of men bathe in the river, and no one is taken. Occasionally an alligator is seen, and is then the talk of the hour.

Weeds.—“Goat-weed” is the weed of the district, something like chick-weed in its habit; derives its name from its billy-goat-like smell. The Johnstone River grass—like summer grass somewhat—if allowed to get possession, is a similar contract to summer grass to eradicate, but does not seed to the same extent. Parramatta weed, or ink plant, Lantana, nut grass, Scotch thistles, Noogoora and Bathurst burr, stinking rodger, chick-weed, and Johnstone grass, are all bad weeds, none of which are found in the district. Weeds of less importance, such as long-toms, pig weed, and sow thistle, are here.

MARKETS.

Some doubt may exist as to the disposing of produce that may be grown on the river. To anyone 1,000 miles or more south no doubt, it seems a very long way off, and freight so high. Oranges, bananas, and any fruit that will stand handling and carriage, can be sent to, first and nearest, Charters Towers and Townsville, at a cost of 10s. per ton freight to Townsville. Then there are Brisbane, Sydney, Melbourne, and Adelaide, to which the Johnstone River bananas go. Sugar-cane requires mills, and if there is anything in manufacturing sugar, this is the spot for the sugar-miller to erect mills in.

Arrowroot has the Southern markets, also the world's market, the same as fruit, coffee, &c.

Maize and Sweet Potatoes.—Cairns and Russell River maize find a market in Townsville, Charters Towers, and sometimes farther south. These markets are some 50 miles closer to the Johnstone. There is a limited demand for maize on the two plantations and in the town. The same remarks apply to sweet potatoes and vegetables.

SUMMARY.

A vast extent of fertile land. A most ample supply of fresh water everywhere. A climate in which frost and drought are unknown. A fairly level surface, good drainage, absence of stones. Immunity from floods, owing to the entire drainage basin, consisting of deep porous soil, retaining the copious rainfall, and letting it into the stream channels by degrees. Few weeds. No marsupials. No danger from bush fires. A good supply of timber for building and fencing purposes and firewood. Crown lands ultimately easy of access, owing to gentle grade of country. Proximity of said land to deep water at Geraldton and Mourilyan Harbour, viz., 7 to 14 miles. A regular rainfall and a dry season during the winter months in which to harvest crops, burn off, &c.

A healthy climate with no malaria, and few mosquitoes. Proximity to markets in Townsville, Charters Towers, and Croydon, and in the near future the mining centres that will develop inland all within 300 miles at the farthest. (Experts consider the country within the distance mentioned as the richest in gold, silver, tin, copper in Queensland.) In a few years all this immense tract of mineral country will look to this Johnstone River district for its supplies of food stuffs and agricultural products. Some who come to the district will require outside work for the first few years. Labour is always scarce in the sugar season. I will rapidly run over the work that is most likely available:—

Cane cutting.—Trashed cane from 2s. to 2s. 6d. per ton, including loading only on to tram trucks, a gang of from fifteen to twenty men would have to work together at this. Holing: Cane holes from 2s. to 3s. per 100 holes; a man can make 5s. to 7s. per day at this work. Felling scrub, 30s. to £2 per acre. Paling-splitting for banana crates 5s. per 100. Timber used is an oak similar to silky oak to work. Lengths 2 to 3 feet. Besides the mentioned jobs there are others that occur from time to time, such as divisional board contracts. Lumping on the wharves is a job a few handy shillings can be earned at. Rates 1s. per hour. As there are several boats from 100 to 300 tons burden loading and unloading every week, this job is worth mentioning, as a new comer with no money to spare could thus pay something towards his ration account instead of idling away time. There is a splendid hospital, two doctors and a chemist resident in the town, a State school, and two provisional schools on the Johnstone, besides saddlers, storekeepers (who charge reasonably for their goods), butchers and bakers, post and telegraph offices.

We have land, rainfall, good ports, and markets. What we want is men with money and experience, and in a few years this district will become not only the largest sugar-producing centre, but the most extensive, wealthy, productive, and populous district in Queensland if not on the continent.

TOBACCO NOTES.

By R. S. NEVILL.

The late crop of cigar tobacco grown in Connecticut, under shade, and superintended by the Government experts, sold at auction, brought an average of 5s. 6d. per lb., while that grown in the open field sold for only 1s. 8d. per lb. The average cost of producing the tobacco under shade was 2s. 1d., showing a profit of over 100 per cent. Some of this tobacco sold as high as 7s. 6d. per lb. It was grown from Sumatra seed, used for cigar wrappers, and gave great satisfaction to the manufacturers. Last year 41 acres were put under shade, and it is estimated that 645 acres will be under shade the coming year. It is thus shown painstaking pays in growing and handling tobacco.

WHAT NICOTINE REALLY IS.

In a communication about tobacco, Professor John W. Mallett, of the University of Virginia, says:—

Ignorance of easily ascertainable scientific facts is, however, common enough, as is often illustrated by the brown oily material formed in the nicotine, though in reality this is merely the tar produced by the action of heat on the wooden fibre of the leaf.

Nicotine, when pure, is a colourless fluid of somewhat oily consistence, and a strong, peculiar, penetrating odour, but it darkens on exposure to air and light, becoming first yellow and then brown, so that it looks, in this darkened condition, something like the tarry matter which soils a smoker's fingers, or a handkerchief through which tobacco smoke is exhaled, or is often noticed as deposited in the stem of a pipe. This tarry deposit has nothing essential in common with nicotine, and contains but traces of this alkaloid, when any at all. A part, but only a small part (about one-seventh, in the experiments of Melsen), of the real nicotine of tobacco is volatilised without decomposition the remainder is burned and destroyed in the process of smoking.

The sensational statements occasionally made in regard to arsenic, copper, &c., as present in the paper wrappers, would be at once seen to be grossly improbable, if it were but remembered that the wrapper of a single cigarette weighs little more than half a grain, and that in such a minute quantity of thin, delicate white paper there could be introduced but infinitesimal amounts of such foreign adulterants without the presence becoming perceptible to common observation by the senses, aside from the positive scientific evidence that they are not present.

EDWARDS, GOODWIN AND Co.'s ANNUAL TOBACCO REPORT.

27 Gradwell street,

Liverpool, 31st December, 1902.

Prices.

STRIPS.	1902.	1901.	LEAF.	1902.	1901.
WESTERN—			WESTERN—		
Fillers	— @ 5	4½ @ —	Common export ...	— @ —	— @ —
Rather short	5½ " 5½	5½ " 6	African export ...	— @ 5 @ 6½	— @ 5 @ 6½
Very middling to middling	6 " 6½	6½ " 6½	Short trade ...	— @ 4	— @ 4
Good to fine	7 " —	7 @ 8 @ —	Medium to good trade	4½ " 6	4½ " 6
BURLEY	5½ @ 8 @ —	6 " 9 " —	BURLEY	6 @ 7 @ 8	7 @ 7½ @ 8
VIRGINIA DARK—			VIRGINIA DARK—		
Fillers	— @ 5½ @ 6	5 @ —	Common export ...	— @ —	— @ —
Rather short	6 @ 6½	— " 6	Short trade ...	— " —	— " —
Very middling to middling	6½ " 7½	6½ " 7½	Medium trade ...	4 " 5	4 " 5
Good to fine	8 " 10	8 " —	Good to fine trade ...	5½ " —	5½ " —
VIRGINIA and CAROLINA			VIRGINIA and CAROLINA		
BRIGHT—			BRIGHT—		
Semi-dark	— " 7½	— @ 7½	Common or semi-bright	— " 8	6 " 7
Semi-bright	8½ @ 9 @ —	8 @ 9 @ —	Medium or mixed ...	8½ @ 10 @ —	8½ @ 10 @ —
Medium or mixed ...	10 @ 11	10 @ 11	Good to fine	11 " 12 " 15	11 " 12 " 15
Good to fine	11½ @ 12½ @ 14	11½ @ 12½ @ 14			

Strips is tobacco with the middle or large stem taken out.

The sales in the month which has just closed, although perhaps not so numerous as those immediately preceding it, were of more importance, and, whilst the business was without any special feature, yet the turnover must be considered as satisfactory under present conditions.

In reviewing the course of the market for the year, it will be noticed that the strong wave of activity which rendered the latter part of 1891 so noteworthy continued to make its influence felt in January, but gradually spent itself in the following months, a period of reaction then ensuing, the dullness continuing more or less throughout the year, and it is only lately that business has begun to show signs of improvement again. There is now, however, every prospect of more healthy and settled trade.

Stocks of tobacco in the United Kingdom, 31st December, 1902 = 201,829,000 lb., the largest ever known.

COFFEE IN QUEENSLAND.

The *Grocer and Oil Trade Review*, London, has the following on the coffee industry of Queensland. Coming from such a reliable authority on British trade, coffee-growers in this State should take heart. Since Mr. Newport's arrival in Queensland the coffee-planters have so benefited by his experience and advice that we are not surprised to learn that the Queensland coffee is rapidly gaining in favour in the world's markets or that the generally high quality is readily acknowledged. The writer of the article says:—

The area under productive coffee-trees in 1901 was 370 acres, and that under non-productive trees 177 acres; the increase in the productive area was 87 acres. The yield for the year was 130,293 lb. It was in the North that coffee cultivation was most closely followed. There were in that division

472 acres under coffee out of a total for the whole of 547 acres. It is estimated that the present production is equal to 45 per cent. of the requirements.

In all instances where coffee is being grown and properly cultivated, paying returns are being obtained. The conditions of soil, climate, temperature, and rainfall are eminently suitable for coffee culture in Queensland. The conditions obtaining admit of its successful cultivation on the comparatively level lands, and at all elevations down to sea-level, and give the planters an advantage over those in countries where the higher levels, steep hills, and more inaccessible places have to be sought to obtain the necessary conditions—advantages especially noticeable in the direction of cultivation and transport, and the by no means to be despised advantage of a healthy and congenial climate.

Cairns, the principal of the coffee-growing centres of North Queensland, comprises both high and low land. The climate is perfect for coffee, the average temperature for the year being from 62 to 65 degrees Fahr., the minimum being about 36 degrees Fahr., and the maximum about 95 degrees Fahr. The rainfall average is 98.34 inches. Several estates on the lower lands, varying in elevation from 50 feet to sea-level, are doing well. The majority of clearings are, however, on the tablelands of the ranges some few miles inland. Kuranda, the central township, is reached by rail from Cairns, after a journey of an hour and a-half through most picturesque scenery. The railway line winds up the range among hills, crossing gorges, and passing waterfalls, reaching an altitude of some 1,100 feet at Kuranda itself. The climate of this tableland is clear, cool, and invigorating. Slight frosts are experienced in winter occasionally in exposed situations, but no trouble is met with in this way upon coffee clearings judiciously selected and carefully opened. The water supply is plentiful, and machinery for coffee curing in several instances is worked by water-power. The quality of the coffee produced here is high. At Kuranda a coffee-grower has opened a factory, and manufactures tins, and disposes of a large proportion of the products of the locality.

A market for the staple exists in the State, where there are several manufacturers who buy up the coffee in the raw or parchment state. With the federation of the colonies that has been recently effected, a larger market still has been opened to this product of North Queensland, with a protection against the imported article. The consumption of the Australian continent is at present very much in excess of the production and will continue to consume all the local produce for many years. In the open markets of the world the coffee of North Queensland, though only small quantities have as yet been offered, owing to the local demand, is rapidly gaining in favour, and the generally high quality readily acknowledged. For buyers who, having no hulling machinery, desire only the clean bean, there are mills in the town of Cairns where the hulling and cleaning is done at a cost of $\frac{1}{2}$ d. per lb., after which the coffee is worth from 9d. to 1s. per lb., according to grade and quality.

[The area under coffee is steadily increasing. There will probably never be large plantations in Queensland, but when export begins it will be of the aggregate produce of numbers of small growers.—ED. Q. A. J.]

BRAZIL COFFEE CROP AND FLOWERING.

At the average percentage observed during the last two weeks (says *Tea, Coffee, and Sugar* of the 3rd ultimo), 66 per cent. entries up to the end of the crop ought to yield 5,000,000 bags, giving a total of about 11,000,000, or, allowing for 1,000,000 bags corresponding to last crop but entered since 30th June, say, 12,000,000 bags. This, we believe, may be regarded as the maximum, the probabilities being that this figure will not be reached. For the last six years the date of receipt of half crop fell in October and November alternately. The October flowering is reported to have been in most districts very fine and to have taken well.—*Planting Opinion*.

Statistics.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE TOTAL RAINFALL FOR EACH MONTH OF THE YEAR IN THE AGRICULTURAL DISTRICTS OF QUEENSLAND.

STATIONS.	1902.												1903.
	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.
<i>North.</i>													
Bowen	0.19	2.19	2.01	0.68	Nil.	0.44	0.11	0.02	Nil.	0.06	0.06	3.16	1.66
Cairns	3.79	12.90	11.43	3.48	2.34	4.97	3.87	0.95	Nil.	0.16	1.38	5.15	21.32
Geraldton	3.78	10.87	7.55	12.83	5.39	8.10	7.32	1.77	Nil.	0.29	0.44	5.53	38.94
Herberton	0.67	5.77	3.86	1.54	1.07	1.58	2.05	0.08	Nil.	0.93	1.13	7.02	6.88
Hughenden	1.57	2.02	0.53	*	Nil.	Nil.	Nil.	Nil.	Nil.	0.05	0.22	2.77	1.52
Kamerunga	2.53	10.59	14.24	3.40	2.63	5.12	4.00	0.81	Nil.	0.29	1.57	3.79	20.36
Longreach	0.87	0.27	0.18	0.03	0.03	Nil.	Nil.	0.05	Nil.	Nil.	1.27	1.56	1.81
Lucinda	3.55	11.38	2.67	1.78	*	0.63	0.21	0.45	Nil.	0.22	0.10	2.47	17.43
Mackay	3.78	8.43	4.41	6.73	1.26	2.33	0.59	0.80	Nil.	0.17	0.35	7.71	10.45
Rockhampton	4.79	1.36	1.68	0.21	Nil.	Nil.	Nil.	0.09	1.41	0.05	0.51	5.60	0.92
Townsville	2.24	3.14	1.61	0.35	0.04	0.10	Nil.	0.10	Nil.	0.29	0.08	6.50	4.66
<i>South.</i>													
Barcaldine	2.39	0.07	0.37	0.02	Nil.	Nil.	Nil.	0.08	0.02	0.21	0.95	6.41	3.73
Beenleigh	2.41	1.82	0.68	0.42	Nil.	0.11	0.62	0.49	0.28	2.92	3.36	1.83	1.88
Biggenden	2.12	0.83	1.80	0.65	Nil.	0.04	0.08	0.04	1.58	2.34	0.25	8.98	2.25
Blackall	1.68	0.34	0.34	0.05	Nil.	0.01	0.01	0.21	0.27	0.12	1.05	4.61	3.04
Brinsbane	1.38	2.67	0.76	0.17	0.47	0.06	0.55	0.98	1.30	3.42	2.59	1.82	1.31
Bundaberg	6.33	0.75	1.99	0.43	0.02	Nil.	0.07	0.13	0.31	1.24	0.65	1.38	0.97
Caboolture	2.29	2.66	1.29	1.99	Nil.	0.03	0.20	0.05	1.09	2.30	3.17	1.74	5.15
Charleville	0.47	0.22	0.42	0.23	Nil.	0.12	Nil.	1.04	0.30	1.05	2.14	4.79	1.70
Dalby	1.65	0.20	0.30	2.00	Nil.	0.15	Nil.	0.41	0.70	3.14	2.79	3.29	1.28
Emerald	3.28	1.11	0.97	0.30	Nil.	0.01	Nil.	Nil.	0.02	0.01	1.58	8.42	2.30
Esk	1.81	1.06	0.75	1.25	Nil.	0.04	0.25	0.15	0.64	0.93	4.00	7.67	1.32
Gatton College	2.27	1.58	0.26	*	0.04	0.03	0.04	0.64	0.73	2.41	3.72	5.14	3.68
Gayndah	2.54	0.51	0.99	0.81	0.29	Nil.	Nil.	0.05	0.64	2.10	2.08	3.37	0.77
Gindie	1.35	1.46	0.78	0.47	Nil.	Nil.	Nil.	0.10	Nil.	1.65	7.14	1.43	1.43
Goondiwindi	2.06	0.75	1.20	0.06	0.02	0.41	Nil.	1.19	0.21	1.50	0.89	2.21	1.84
Gympie	1.49	1.65	2.33	1.09	0.23	Nil.	0.36	0.94	1.38	3.80	1.40	4.32	2.40
Ipswich	1.45	2.80	0.32	0.03	0.02	0.15	0.31	0.77	0.30	2.86	3.45	1.84	1.36
Laidley	1.79	1.94	0.39	0.10	0.20	0.06	Nil.	0.40	0.89	2.21	3.27	5.13	0.71
Maryborough	1.29	0.75	0.96	1.57	0.36	0.24	0.29	0.57	0.69	0.91	1.11	4.02	2.09
Nambour	1.30	2.06	1.61	†	0.28	0.04	*	0.70	0.35	1.26	1.66	2.64	2.53
Nerang	3.98	4.54	0.65	0.65	0.35	0.52	1.07	1.22	1.17	3.15	1.75	1.73	3.36
Roma	2.72	1.11	0.64	0.15	Nil.	0.20	Nil.	0.46	0.35	0.92	0.86	2.35	0.75
Stanthorpe	3.17	0.51	0.56	0.10	0.87	0.78	0.15	0.94	0.95	2.29	3.98	1.75	0.23
Tambo	1.73	0.35	0.68	0.04	Nil.	0.01	Nil.	0.28	0.06	0.41	1.34	4.14	2.43
Taroom	0.53	1.82	1.30	0.33	Nil.	Nil.	Nil.	0.17	0.45	0.68	1.40	2.88	4.32
Tewantin	3.09	1.13	3.44	2.84	0.80	0.91	0.91	0.85	0.87	1.94	1.96	1.35	1.90
Texas	1.95	1.62	0.42	Nil.	Nil.	0.88	Nil.	1.57	0.13	2.42	1.67	1.42	0.18
Toowoomba	3.46	1.20	Nil.	0.79	0.03	0.38	0.19	0.56	0.37	3.07	3.18	6.99	2.21
Warwick	3.48	0.65	0.55	Nil.	0.15	0.63	0.20	0.94	0.43	2.96	2.87	4.61	0.68
Westbrook	3.21	1.04	0.06	0.41	Nil.	0.28	0.06	0.29	0.38	3.20	3.34	3.37	4.21

CLEMENT L. WRAGGE,

Wragge's Weather Bureau.

PRICES IN BRITISH MARKETS OF ARTICLES WHICH CAN BE PRODUCED IN QUEENSLAND.

BUTTER.—New Zealand, choicest, 110s. to 112s.; Danish and Swedish, choicest, 110s. to 112s.; Canadian, choicest, 102s. to 104s.; New South Wales and Victorian, choicest, 108s. to 110s. per cwt.

CHEESE (duty free).—American, 58s.; Canadian, 60s. per cwt. A rise of 2s. or 3s. for Canadian is likely. New Zealand cheese only just arriving.

CONDENSED MILK.—18s. 6d. to 20s. 6d. per case in 20-case lots.

SUGAR (duties, raw, 2s. to 3s. 10d. ; refined, 4s. 2d. and $\frac{1}{4}$ per cent.).—Refined, £13 15s. to £16 5s. per ton ; raw, £10 10s. to £11 5s. ; German beet, 88 per cent., 8s. 4 $\frac{1}{2}$ d. per cwt.

MOLASSES (duty, 2s. per cwt. and $\frac{1}{4}$ per cent.).—6s. to 8s. per cwt.

RICE (duty 5d. per cwt.).—Rangoon, £8 to £14 ; Japan, £12 10s. to £17 ; Java, £18 to £24 ; Patna, £17 to £21 per ton.

COFFEE (in bond, duty 1 $\frac{1}{2}$ d. per lb. and $\frac{1}{4}$ per cent.).—Ceylon plantation, 45s. to 120s. ; peaberry, 74s. to 123s. ; Santos, 30s. to 58s. ; Mocha, 55s. to 70s. ; Jamaica, 100s. to 124s. per cwt.

ARROWROOT (duty, 5d. per lb.).—Bermuda, 1s. 3d. to 1s. 8d. ; St. Vincent, 3d. to 5 $\frac{1}{2}$ d. ; Natal, 5d. to 8d. per lb.

WHEAT.—Manitoba, 30s. 1 $\frac{1}{2}$ d. to 33s. per 480 lb. ; Californian, 31s. per 500 lb. ; English, 28s. 6d. to 31s. per 504 lb.

FLOUR.—24s. to 28s. per 280 lb.

MALTING BARLEY.—27s. to 30s. per 448 lb.

OATS.—New Zealand, 26s. to 28s. per 336 lb.

SPLIT PEAS.—45s. per 504 lb.

GINGER.—Japan, 35s. to 36s. ; Jamaica, 50s. to 55s. per cwt.

PEPPER.—Black, 5 $\frac{3}{4}$ d. to 6 $\frac{1}{4}$ d. ; white, 9d. to 9 $\frac{1}{4}$ d. per lb. ; capsicums, 16s. to 80s. ; chillies, 34s. to 40s. per cwt.

WINES.—Australian Burgundy, red, 18s. per dozen ; quart flagons, 17s. to 23s. per dozen.

GREEN FRUIT.—Oranges, common, 7s. 3d. to 9s. ; medium, 10s. to 12s. ; fine selected, 15s. 8d. to 17s. 9d. ; finest selected, 20s. to 25s. 8d. per 420 ; lemons, ordinary to fine, 6s. to 15s. ; finest selected, 20s. to 22s. per case of 420 ; bananas, 10s. to 12s. 6d. per bunch ; apples, American, 18s. to 26s. per case ; grapes, from 9s. for common to 30s. for choicest, per barrel.

COTTON.—Uplands, 4 $\frac{5}{8}$ d. ; Sea Island, 8d. to 9d. per lb. Market rising.

COTTON SEED.—No quotation will be given until the next crop comes in.

COTTON-SEED OIL CAKE.—£7 per ton.

COTTON-SEED OIL.—Crude, 20s. to 23s. per cwt.

LINSEED.—40s. 6d. to 50s. 6d. per cwt.

LINSEED OIL.—23s. 9d. to 24s. per cwt.

LINSEED OIL CAKE.—£7 10s. to £7 15s. per ton.

COPRA (coconut kernel).—£15 15s. to £16 10s. per ton ; £8 to £9 per ton at the South Sea Island trading stations. Corresponding value in Queensland, £10 to £12 per ton.

COCONUT OIL.—30s. to 35s. 6d. per cwt.

MANILLA HEMP.—£25 to £30 ; New Zealand, £29 10s. per ton.

SISAL HEMP.—Worth £35 per ton in the Australian Southern markets.

FROZEN MEAT.—The following are the Frozen Meat Trade Association's Smithfield market quotations for the undermentioned classes of frozen meats, based on actual sales of not less than 100 carcasses of mutton or lamb, or 25 quarters of beef of fair average quality. These quotations are not for selected

lines, but for parcels fairly representative of the bulk of the shipments now on the market:—

New Zealand Sheep.

(Crossbred Wethers and Maiden Ewes.)

	Feb. 14.	Feb. 21.
Canterbury, light (48 lb. to 56 lb.)	4 $\frac{7}{8}$ d.	4 $\frac{7}{8}$ d.
Canterbury, medium (56 lb. to 64 lb.)	4 $\frac{7}{8}$ d.	4 $\frac{7}{8}$ d.
Canterbury, heavy (64 lb. to 72 lb.)	4 $\frac{5}{8}$ d.	4 $\frac{5}{8}$ d.
Dunedin and Southland (56 lb. to 64 lb.)	4 $\frac{3}{8}$ d.	4 $\frac{3}{8}$ d.
North Island (55 lb. to 65 lb.) ...	4 $\frac{1}{8}$ d.	4 $\frac{1}{8}$ d.

Australian Sheep.

(Crossbred and Merino Wethers.)

Heavy (over 50 lb.)	3 $\frac{7}{8}$ d.	3 $\frac{1}{8}$ d.
Light (under 50 lb.)	3 $\frac{7}{8}$ d.	3 $\frac{5}{8}$ d.

River Plate Sheep.

(Crossbred and Merino Wethers.)

Heavy (over 50 lb.)	3 $\frac{7}{8}$ d.	3 $\frac{1}{8}$ d.
Light (under 50 lb.)	3 $\frac{7}{8}$ d.	3 $\frac{1}{8}$ d.

New Zealand Lambs.

Canterbury, light (28 lb. to 36 lb.)	6 $\frac{3}{4}$ d.	6 $\frac{3}{4}$ d.
Canterbury, heavy (36 lb. to 42 lb.)	6 $\frac{3}{4}$ d.	6 $\frac{3}{4}$ d.
Dunedin and Southland (28 lb. to 42 lb.)	6 $\frac{1}{2}$ d.	6 $\frac{1}{2}$ d.
North Island (28 lb. to 42 lb.) new season's	6 $\frac{1}{2}$ d.	6 $\frac{1}{2}$ d.

Australian Lambs.

30 lb. to 40 lb.	5 $\frac{1}{4}$ d.	5 $\frac{3}{8}$ d.
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River Plate Lambs.

30 lb. to 40 lb.	5 $\frac{1}{4}$ d.	5 $\frac{1}{2}$ d.
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New Zealand Frozen Beef.

Ox, fores (180 lb. to 220 lb.) ...	3d.	2 $\frac{3}{4}$ d.
Ox, hinds (180 lb. to 220 lb.) ...	3 $\frac{3}{4}$ d.	3 $\frac{3}{4}$ d.

Australian Frozen Beef.

Ox, fores (160 lb. to 200 lb.) ...	2 $\frac{1}{4}$ d.	2 $\frac{3}{4}$ d.
Ox, hinds (160 lb. to 200 lb.) ...	3d.	3 $\frac{3}{8}$ d.

River Plate Frozen Beef.

Ox, fores (160 lb. to 220 lb.) ...	3d.	2 $\frac{1}{16}$ d.
Ox, hinds (160 lb. to 220 lb.) ...	3 $\frac{3}{4}$ d.	3 $\frac{7}{16}$ d.

(All quotations for beef are nominal.)

EGGS.—French, 15s. 6d. to 16s.; Danish, 14s. to 17s. per 120.

BACON.—Irish, 58s. to 81s.; American, 59s. to 60s. per cwt.

HAMS.—Irish, 88s. to 112s.; American, 56s. to 66s. per cwt.

TALLOW.—Beef, fine, £32 15s.; medium, £32 10s.; mutton, fine, £34; medium, £32 10s. per ton.

Agricultural Patents.

PATENTS ACCEPTED.

6731: Harry Burgon, of 186 Oakbrook road, Sheffield, York, England, sheep shear manufacturer. "Improvements in Sheep Shears." Dated 11th July, 1902. (Drawings, 10s.; specification, 8s.)

6739: Thomas Turner Shaw, of Wooriwyrite Station, near Terang, Hampden, Victoria, station manager, and Thomas Arthur Dennis, of 483 Collins street, Melbourne, Bourke, Victoria, agent. "An Improved Appliance for Lifting Fencing and other Posts out of the Ground." Dated 15th July, 1902. (Drawings, 5s.; specification, 2s. 6d.)

6753: John Pomeroy, of Catherine street, North Invercargill, New Zealand, fishcurer. "Improvements in Sheep Shears." Dated 21st July, 1902. (Drawings, 5s.; specification, 6s.)

6535: Thomas Fennessy, of No. 104 Ross street, Port Melbourne, Victoria, Australia, inventor. "Machine or Appliance for Rolling Swampy, Mallee, and other Lands, and usable for other purposes." Dated 24th March, 1902. (Drawings, 12s. 6d.; specification, 8s. 6d.)

6621: Theophilus Walter Menzies, of Westland Station, Longreach, Queensland, Australia, station overseer. "A Flood-operated Gate or Fence Section." Dated 7th May, 1902. (Drawings, 10s.; specification, 3s. 6d.)

7005: Francis John McDonald and James Fay, grain merchants, both of 95 Elizabeth street, Sydney, New South Wales, Australia. "Artificial Food specially applicable for the Nourishment of the Young of Herbiferous Animals." Dated 9th December, 1902. (Drawings, nil; specification, 3s. 6d.)

6510: James Roberts Jewell, of No. 119 Lygon street, East Brunswick, near Melbourne, Australia, butcher, and William Henry Jewell, of No. 3 Bent street, Northcote, near Melbourne aforesaid, paper bag manufacturer. "Improved Means for Locking the Wheels of Carts and other Road Vehicles." Dated 12th March, 1902. (Drawings, 7s. 6d.; specification, 3s.)

6966: Ida Jacob, of 1 Anger, Rudolstadt, Fürstentum, Schwarzburg-Rudolstadt, Germany, married woman, and Wilhelm Pritzkow, of Rathsgasse Salungen, Sachsen-Meiningen, Germany, chemist. "Manufacture of Fibre suitable for Spinning from New Zealand Flax." Dated 21st November, 1902. (Drawings, nil; specification, 3s.)

6657: Niels Peder Willmann, of Mackay, Queensland, agricultural implement maker. "Improvements in Cultivating Machines." Dated 30th May, 1902. (Drawings on application; specifications, 15s.)

6705: Norman W. Griswold, of Honolulu, Territory of Hawaii. "Improvements in Watering Troughs for Animals." Dated 28th June, 1902. (Drawings, 20s.; specification, 10s.)

6728: John Strachan Buckler, of No. 28 St. James street, Essenden, near Melbourne, Victoria, Australia. "Improvements in and relating to Single Horse Harness." Dated 8th July, 1902. (Drawings, 10s.; specification, 4s. 6d.)

6402: William Maitland Woods, M.A., of the Rectory, Dalby, Darling Downs, clerk in holy orders. "The Prickly Pear Poisonous Pill and Injector." Dated 30th December, 1901. (Drawings, 10s.; specification, 8s. 6d.)

General Notes.

THE BOT FLY.

This fly generally lays its eggs on the flanks of a horse, almost always in spots which the animal can reach with its tongue. Various suggestions have been made as to the best means to destroy the eggs. One grazier says that the simplest way is to strike matches and lightly burn the hair from the egg infested patches without hurting the horse. To get rid of the worms inside, it has been shown by a German professor that a dose of tansy tea, followed a few hours later by half-an-ounce of salts, is a certain cure, hundreds of worms being passed by this means. Regular grooming would probably remove the eggs, but thousands of horses never get any grooming, and all that can be done with these is to try the match business, or wash the parts with dilute carbolic acid or kerosene, or dose with tansy tea.

CURE FOR ECZEMA.

Mr. H. E. Meyers thinks it would be of value to many people in the bush to know that an itching sore of long standing on the foot, apparently incurable, may be perfectly cured in a short time by mixing equal parts of white lead and castor oil near the fire. Spread the ointment on a piece of linen and renew morning and evening. Every day give a good washing with tar soap, and rub well with a coarse towel. [Powdered oxide of zinc will have the same effect — Ed. *Q.A.J.*]

TREATMENT OF BLACK LEG.

A correspondent of the *Farmer and Stockbreeder* writes on the above subject:—

We commence to drench our yearling calves every year in October or November. We give the calves about half-a-pint of urine and about two teaspoonfuls of turpentine for nine mornings, and then leave off for nine mornings. We again commence. Put the urine in the bottle first, and then the turpentine on the top. We do not measure anything. The urine should be fresh every morning. We keep at it to the end of March or beginning of April, and then leave off.

For their food, give them some hay. Do not give them any meal. After being drenched in the morning let them fast for half-an-hour or so. I would advise all those whose calves are troubled with this disease to give it a fair trial. I do not say they will never lose any, but give it a trial. I have used it for about ten years with success. We do not give it to them on Sundays. Keep to the nine mornings.

BEEF SUPPLIES OF THE FUTURE.

The *Pastoralists' Review* says:—

People are looking to the Gulf and Port Darwin country as the area from which beef is to come in future. The promoters of the S.A. Land Grant Railway, as well as the proprietors of the concessions for the Normanton-Cloncurry and Lorne Hills Railways, entertain hopes with regard to cattle country and restocking on their properties.

The same journal says that one of the Australian land companies recently inquired as to the net outturn of bullocks on Smithfield, sent frozen; the company had in view the restocking problem in regard to price. A 700-lb. New Zealand body of beef netted, allowing for offal and hide, £10 10s.; an Argentine one, £9 10s.; and an Australian carcass, £9.

COLIC.

In our article on "Colic in Horses," by "Vet.," in the January issue, an error occurs in the second prescription for spasmodic colic in the third ingredient, which should read—Extract belladonna, 1 dr., *or* laudanum, 1 oz.

CARE OF IMPLEMENTS.

Notwithstanding all that we and others have written about the extraordinary indifference evinced by farmers to the protection of their farm implements from the destructive effects of wind, rain, and sun, the want of care in this respect continues to be a blot on many a Queensland farm. We have observed this defect in rural economy in the far North as well as in the South, and lately it was much in evidence in the Central districts. We cannot understand how it is that a man will pay 2 or 3 guineas for a boar, say, and as a rule he will value that animal and look after him, and strive all he knows to keep it in health and vigour. The same man will pay £20, £30, or £40 for a valuable machine, and he will leave it out in the field where it was last used, unsheltered, unpainted, and so rusty that not a nut or bolt can be moved without the help of a quart of kerosene and a powerful screw-wrench. This is the more reprehensible in the far West, seeing that heavy railway freight has to be added to the original cost of the machine. How such intelligent, well-to-do, up-to-date farmers, as the majority of our Queensland farmers are, can placidly look on whilst their hard-earned money is being eaten away by the elements, passes our comprehension. A few rough posts and a dozen sheets of bark or damaged iron would make a shed which any rouseabout could erect in half-a-day. Then, what trouble is it to the ploughman to hitch his horses to the plough or harrow, or to the reaper and binder, and put them under cover, instead of taking the horses home and leaving these valuable implements in the field? It is not to be expected that the hired man will look after these things if the owner himself does not do so. Wherefore we, for the twentieth time, draw attention to such wilful waste.

REMEDY FOR SORE BACKS.

A correspondent from Normanton writes:—It may be useful to some of your readers to know that many bushmen use the "Puff Ball" found growing in the bush with much success on sore backs of horses. They gather it when brown and dry and keep it in a dry bottle or tin. The powder is applied after cleansing the wound. It is also stated that the powder will stop bleeding when all else fails.

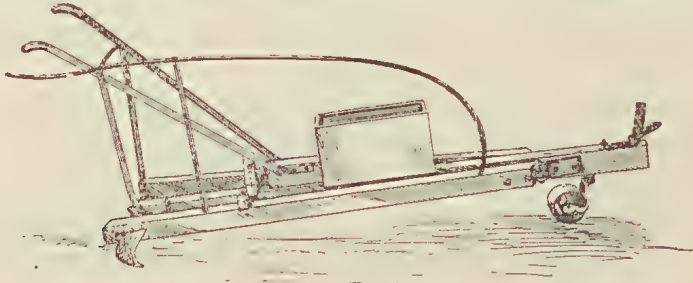
GINSENG—A CAUTION.

Mr. H. E. Meyer, Brooloo, Gympie, sends us an extract from an American journal, dealing with Japanese ginseng. The extract is in the form of a letter, apparently an answer to one written to Messrs. S. Wells and Co., ginseng and beeswax exporters, of Cincinnati, to the Chinese-American Ginseng Co., Joplin, Mo., U.S.A. They say: "Our object in writing regarding Japanese ginseng, was to caution you against it. Japanese ginseng is worthless, and will seriously injure the American root if grown in this country (U.S.A.). Should at any time anyone correspond with you regarding the cultivation of Japanese ginseng, you cannot too forcibly impress upon them the disaster which will result if they grow it with American ginseng. Together with the Agricultural Department at Washington, we are trying to suppress this injurious business, so as to protect and preserve the cultivation of American ginseng. It is impossible to name a price on cultivated root without having first seen exactly the quality a garden will produce. Each garden and gardener impress their peculiarities upon the roots they raise."

[We should like to have further information as to the worthlessness or otherwise of Japanese ginseng. The Japanese are scarcely the people to grow a worthless article.—Ed. *Q.A.J.*]

THE TARDENT CORN-HARVESTER.

By an oversight the illustration of the maize-harvester invented by Mr. H. Tardent was omitted in our article on maize-growing in the February issue of the *Journal*. As we have been requested to supply the omission, we now do so, referring our readers to page 86 of the last issue for explanations.



CHANGING THE SEX OF DATE PALMS.

The *Journal d'agriculture tropicale* says that it is possible to change the sex of the date palm.

The inhabitants of the southern oases in Algeria maintain that it can readily be done. Of 100 date palms 80 are male trees, hence it may readily be conceived that it is greatly to man's interest that the cultivator's intervention should be crowned with success. The method consists of tearing off all the leaves from the footstalks at two or three years of age, so that the medial nerve is split in two from the centre to the leaf sheaf. The idea of the Arabs is that this tearing process brings on a concentration of the sap movement in the same way as in the case of an annular incision, and results in an accumulation of sap, which is more necessary for the vital functions of the female plant than for those of the male. No objection, says the editor, from a vegetable pathological point of view, can be raised against the above assertion, for the reason that in young plants the organs are not yet different from each other.

HONEY IN THE AMERICAN MARKET.

In an article in our last issue extracted from the *Agricultural News*, Barbados, two manifest errors occur. 42 cents per gallon of 14 lb. is quoted as equivalent to 16s. per cwt., and 55 cents as the equivalent of 11d. in English money. The figures should have been 14s. per cwt. and 2s. 3½d.

A NEW PROCESS OF CLEARING RAMIE (CHINA GRASS).

M. Anxionnat, secretary of the National Agricultural Society of France, has sent us (*Journal d'Agriculture Tropicale*) a letter from M. Paul Serre, Consulate of Shanghai, from which we extract the following:—"An Austrian, naturalised a British subject, has invented a new process of decorticating Ramie, which he has sold for £500 to an Anglo-Chinese company at Shanghai. This company has already dressed, in its factory at Shanghai, and despatched to Europe, a very white and silky ramie fibre. It is said that the process does not require the use of any acid. Needless to add that the secret is carefully preserved. We are assured that English capitalists are about to furnish a very large sum to the inventor, to enable him to establish a large ramie-dressing establishment at Shanghai.

The price of ramie has been much increased by the Japanese in consequence of their large regular purchases for their manufactures.

SHOW DATES.

NANANGO AGRICULTURAL, PASTORAL, AND MINING SOCIETY.

The next show under the auspices of the above society will be held on the 13th and 14th May next.

CENTRAL DOWNS A. AND H. ASSOCIATION.

In consequence of the disastrous effects of the drought, the annual show of the above association will not be held this year.

BIGGENDEN AGRICULTURAL AND PASTORAL SOCIETY.

The tenth annual show of the society will be held at Biggenden on Thursday and Friday, the 9th and 10th July.

WELLINGTON POINT A. H. AND I. ASSOCIATION.

It has been decided by the committee of the above association to hold the annual show on Wednesday, 8th July.

NATIONAL AGRICULTURAL AND INDUSTRIAL ASSOCIATION OF QUEENSLAND.

The secretary notifies that the dates for holding the next annual exhibition have been fixed for the 11th, 12th, 13th, and 14th August.

The secretary of the Rockhampton Agricultural Society notifies that the annual show of the society will be held on the 12th and 13th June.

The annual exhibition of the Wide Bay and Burnett Pastoral and Agricultural Society will be held at Maryborough on Wednesday, Thursday, and Friday, the 22nd, 23rd, and 24th July.

DEGILBO DISTRICT FARMERS' ASSOCIATION.

The secretary notifies that the show of the above Association will be held on 11th and 12th June.

PIONEER RIVER FARMERS' ASSOCIATION.

The Annual Show will take place on the 22nd and 23rd June next.

AGRICULTURAL AND HORTICULTURAL SHOWS.

The Editor will be glad if the secretaries of Agricultural and other Societies will, as early as possible after the fixture of their respective shows, notify him of the date, and also of any change in date which may have been decided on.

Answers to Correspondents.

DOUGLAS MIXTURE.

J. EILER, Bundaberg.—Douglas mixture is made of sulphuric acid and sulphate of iron—1 ounce of the former and $\frac{1}{2}$ lb. of the latter. Dissolve in 2 gallons of water, and add 1 tablespoonful to every gallon of the fowls' drinking water.

CHICORY.

D. McMULLEN, 17-Mile Rocks, Oxley:—

1. Chicory will thrive in any soil that will suit carrots and parsnips. Sow in August, afterwards transplant in wet weather. For cultivation and preparation see *Journal*, Feb. 1st, 1903, p. 154; also Oct 1st, 1902, p. 296.

2. Add only sufficient water to extract all the honey from the comb. If too thick add more water. Bring to a boil after straining. As soon as it boils, set it to ferment for from two to five days; then bottle.

WHITE FLAKES IN BUTTER.

SOUTH KOLAN.—With reference to your question as to the cause of white flakes in butter, Mr. R. W. Winks, dairying expert, writes:—

They may be the result of too much casein remaining in the butter, due probably to a thin cream having been churned at a high temperature. Under such circumstances, the butter could not be kept in granular form during the washing process, thereby making it impossible to cleanse the mass thoroughly. I would suggest that a thicker cream be run from the separator, and in the case of two days' cream being churned together that, after being thoroughly mixed at least eight hours previous to churning, the cream be brought to as near 60 degrees Fahr. as possible, by means of a water-bag and being exposed in shallow trays in the open air overnight. Scalding the cream is a primitive system of pasteurisation; and during the summer months in particular, either milk or cream subjected to such a high temperature should immediately be cooled to the lowest point possible.

A.B.S.—

PIGWEEED—FRUIT TREES—VINES.

1. All green plants ploughed under have a certain manurial value. Pig weed will not give nitrogen like beans, peas, &c., but it will provide a certain amount of humus, from which nitrogen is evolved.

2. Citrus fruit trees will withstand total immersion for twelve hours, and partial immersion makes little difference.

3. The only grape vine which will stand immersion is the "Isabella."

The advice of Messrs. A. H. Benson, Instructor in Fruit Culture, and E. H. Rainford, Instructor in Viticulture, is: Do not plant fruit trees or vines on land subject to flood.

DUCKLINGS DYING.

W. W., a new reader, Townsville.—The poultry expert at the Queensland Agricultural College, advises, with reference to the ducklings mentioned in your letter, that they are suffering from the staggers, caused either by the sun striking so hotly on their brain, or by overcrowding. Put their heads under a tap of cold water, letting the water run for about five minutes; this treatment will often bring them round. They also appear to have a slight attack of roup, the symptoms of which are a little foam and dry matter around the eyes. Wash the eyes with hydrogen dioxide and water in equal parts, injecting some into their nostrils with a small syringe or the oil can of a sewing machine: add a little sulphate of iron to the drinking water, just sufficient to give it a slightly bitter taste. The Sunlight oil-cake is a very good food, but should not be fed too liberally; a small quantity should be mixed with the pollard, and a little salt with it.

NON-SETTING OF SWEET POTATOES.

G. C. H., Nickenbah—

Mr. G. B. Brooks, manager of Biggenden State Farm, says :—

The communication from your correspondent, G. C. H., Nickenbah, *re* the non-setting of sweet potatoes to hand.

As requested, I beg to make the following remarks thereon :—

That the trouble referred to is not altogether an uncommon one.

That although various influences may tend to bring it about, the most common one is the want of care in selecting cuttings from the most fruitful vines. It is a well-known fact that a cutting will, in almost any case, reproduce the peculiarity of the parent plant; therefore a crop of tubers cannot be expected from vines taken from an unfruitful parent.

That the class of soil has also much to do with the non-tubering trouble. Many soils will produce a good crop of sweet potatoes when newly broken up and in a loose friable condition, but having been under crop for a few years, and consequently closer in texture, the results obtained are identical with those of your correspondent—plenty of vines and strings, but no tubers.

As a remedy, I would suggest your correspondent procuring some good tubers from a reliable source, preferably from another district. By planting in a hotbed and giving a plentiful supply of water a number of cuttings could be obtained from the same eye in a very short space of time.

I may add that the dry seasons we have been experiencing lately will have a tendency to deteriorate the sweet potato through indiscriminate planting of rubbishy, “worn-out” vines. Cuttings have been so scarce that anything in the shape of tops, even straggling vines from patches where sweet potatoes have been grown three or four years previously are being made use of.

J.O., Pie Creek, Gympie, writes on the above subject that the best method of dealing with the plants is to twist up the vines in a heap on top of the root. It will then be found that the potatoes will at once begin to form. It does not matter how rich the land is, providing the tops are twisted. We shall be glad if any grower would try J.O.’s plan, and report the result to us.

LIGHTNING CONDUCTORS.

ENQUIRER.—Write to Mr. T. Tonks, engineer, Elizabeth street, Brisbane. The price of conductors varies from 1s. per foot to 5s. per foot. Finials may be had at from 15s. upwards.

2 You must be confusing the names of “grape fruit” and “grape nut.” We do not know of such a product as the grape nut. Grape fruit is a fruit of the Shaddock family, so called because it grows in clusters. It is full-juiced, has a delicate flavour, and is much valued on account of its tonic properties.

TO PREVENT WHITE ANTS ATTACKING CITRUS TREES.

T. E., Alice River Settlement, Barcaldine.—

1. Place a small quantity of arsenious acid round the tree in the soil, not touching the tree.

2. Pieces of pine wood saturated with Street’s white ant mixture buried close to the trees will effectually destroy them.

DUSTING VEGETABLES WITH PARIS GREEN.

CHARLES DUN, Noosa.—Mix in the proportion of 1 oz. to 100 oz. of flour, and dust it from a bag, just applying enough to make a slight show on the leaves—say 1 oz. of mixture to twenty-eight heads of cabbage. That will be about one-seventh of a grain of poison to each plant. Half the powder will fall on the outside leaves and on the ground, so to be poisoned a person would have to eat twenty-eight cabbages at a sitting even if the rest of the poison remained after cooking.

JOHNSTONE RIVER DISTRICT.

PIONEER, Central Queensland—

1. The purchasing price of agricultural farms in the Johnstone River district may range from 10s. per acre upwards, as may be declared by proclamation. The term is twenty years. The annual rent is one-fortieth of the purchasing price, and the payments are credited as part of the price; 1,280 acres is the largest area allowed. The land must be continuously occupied by the selector or his agent. Within five years of the issue of the license to occupy the land must be enclosed with a good substantial fence, or substantial improvements equivalent to the value of such fence must be made. When the improvements are made and approved, a lease is issued, and the lessee may then mortgage the land, if he wishes to do so. The lessee may then pay up the balance of the purchase money, and obtain a deed of grant in fee-simple. Agricultural homesteads are limited to 160 acres. The price for a homestead is 2s. 6d. per acre, and the annual rent 3d. per acre for ten years. The occupation and improvement clauses apply here also.

2. Alligators are numerous in all rivers north of Mackay; but with ordinary care, such as avoiding swimming in deep pools or sitting close to a sloping bank of the river, no danger from them need be apprehended.

3. No obstacles beyond those which in all parts of Queensland beset the settler in new districts where roads are bad in wet weather. But the river is navigable for boats for over 20 miles from the mouth.

PROTECTING MAIZE FROM WEEVILS.

A. H. B., Westwood.—It is not safe to use bi-sulphide of carbon with corn intended for seed. It is all right if the corn is only intended for feed. Salt is the best protective agent. A farmer discovered this by accident. He sacked up some grain in an odd lot of sacks, some of which had contained salt, and had grains of salt still clinging to them. When ready to market, he unsacked the lot, and found that whilst the grain in the salt sacks was perfectly free from weevils, that in the other was riddled by them. He has always used salt since, and has never had any trouble about weevils. When the unhusked corn was piled up in the barn, he dissolved a quart of salt in two gallons of water, and sprinkled the corn as it was thrown in. No insects touched it.

STUMPING SCRUB LAND.

J. KIDD, Nanango.—It is usual to allow the larger stumps on newly-felled scrub land to remain to rot. In three years they are easily removed. If you want to get them out at once write to Mr. Thomas, Diddlebar, Paynter's Creek. He has invented an excellent and very simple contrivance for stump pulling. We have seen it at work, and can vouch for its usefulness. It is very cheap, consists merely of wire ropes and blocks, and a light windlass. The price is £10 or £12. It will draw two stumps at once, with the labour of only one man. See illustration in the January issue of this *Journal*, page 4, Plate III.

TRAVELLING SHEEP.

I. M., 17-mile Gate, Kilkivan Line—

1. By section 6 of "*The Diseases in Sheep Act of 1890*," any person travelling through or across any run, or along any road forming the boundary of a run, must give the occupier not more than 48 nor less than 24 hours' notice, and a "run" means any station or any freehold or leasehold where horses, cattle, or sheep are ordinarily depastured. Penalty not exceeding £50. Sheep must be travelled at least 6 miles towards their destination in each 24 hours, unless prevented by rain or flood.

Public reserves on roads are intended purely for camping purposes for stock or teams.

2. Sketch of Corn-harvester appears in this issue.

PASPALUM DILATATUM.

ENQUIRER No. 2.—

1. Paspalum roots should be planted about 3 feet apart between and in the rows; allow the first crop to seed, after which a thick crop may be expected.

2. Stock can be put on the field when the grass has made a growth of 3 or 4 inches, or, in other words, when the plants have obtained a good hold in the ground.

3. To your question as to "Why the State Farms could not supply good seed potatoes in January," the reply is, "Because the drought has affected the whole of the potato crops in the Southern part of Queensland." Thanks for the information you supply as to the varieties of potatoes grown in your district.

A FENCING QUESTION.

ANXIOUS SUBSCRIBER, Rockhampton.—Your question involves difficulties which we would advise you to refer to your lawyer. We would not like to give an opinion on the matter.

PIGEONS DETERIORATING—NUMBER OF SOWS PER BOAR.

JOHN BROWN, Rockhampton.—Yes. Pigeons deteriorate unless you introduce new blood at least every second year.

A boar of mature age, well fed, and not allowed to run with the sows, could serve during the year thirty to forty sows.

Mr. L. Price, herdsman at Goodna Asylum, says that a boar not running with the sows could serve eighty during the year, but only thirty-five if allowed to run with them.

Times of Sunrise and Sunset, 1903.

DATE.	JANUARY.		FEBRUARY.		MARCH.		APRIL.		PHASES OF THE MOON.
	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.	
1 ...	5:0	6:42	5:25	6:39	5:45	6:17	6:1	5:43	7 Jan.) First Quarter 7 57 14 " ○ Full Moon 0 17 20 " ☾ Last Quarter 9 49 29 " ● New Moon 2 39
2 ...	5:0	6:42	5:25	6:38	5:46	6:16	6:1	5:42	
3 ...	5:1	6:42	5:25	6:38	5:46	6:14	6:3	5:40	
4 ...	5:1	6:42	5:27	6:37	5:47	6:13	6:3	5:38	
5 ...	5:3	6:43	5:28	6:36	5:48	6:12	6:4	5:38	
6 ...	5:3	6:43	5:29	6:36	5:49	6:11	6:5	5:37	5 Feb.) First Quarter 8 13 12 " ○ Full Moon 10 58 19 " ☾ Last Quarter 4 23 27 " ● New Moon 8 20
7 ...	5:3	6:43	5:31	6:34	5:49	6:9	6:6	5:36	
8 ...	5:5	6:43	5:32	6:33	5:49	6:8	6:6	5:34	
9 ...	5:6	6:44	5:32	6:32	5:50	6:7	6:7	5:33	
10 ...	5:7	6:44	5:33	6:31	5:51	6:7	6:7	5:33	
11 ...	5:7	6:44	5:33	6:31	5:51	6:6	6:7	5:32	7 Mar.) First Quarter 5 14 13 " ○ Full Moon 10 13 21 " ☾ Last Quarter 0 8 29 " ● New Moon 11 26
12 ...	5:8	6:44	5:33	6:31	5:52	6:5	6:7	5:31	
13 ...	5:9	6:44	5:34	6:30	5:52	6:4	6:8	5:30	
14 ...	5:10	6:44	5:34	6:30	5:53	6:3	6:9	5:29	
15 ...	5:11	6:43	5:35	6:29	5:53	6:1	6:9	5:27	
16 ...	5:11	6:43	5:36	6:28	5:54	6:1	6:9	5:27	5 Apr.) First Quarter 11 51 12 " ○ Full Moon 10 18 20 " ☾ Last Quarter 7 30 27 " ● New Moon 11 31
17 ...	5:11	6:43	5:37	6:27	5:55	6:0	6:9	5:27	
18 ...	5:13	6:43	5:39	6:26	5:55	5:58	6:10	5:26	
19 ...	5:13	6:43	5:40	6:25	5:55	5:57	6:10	5:25	
20 ...	5:14	6:43	5:41	6:23	5:56	5:56	6:10	5:24	
21 ...	5:15	6:43	5:41	6:23	5:57	5:55	6:10	5:23	
22 ...	5:16	6:42	5:41	6:22	5:57	5:53	6:11	5:22	
23 ...	5:18	6:42	5:42	6:22	5:58	5:53	6:12	5:21	
24 ...	5:18	6:42	5:42	6:22	5:58	5:52	6:12	5:20	
25 ...	5:19	6:41	5:42	6:20	5:58	5:50	6:13	5:19	
26 ...	5:19	6:41	5:42	6:20	5:58	5:49	6:13	5:18	
27 ...	5:20	6:41	5:43	6:19	5:59	5:48	6:14	5:17	
28 ...	5:21	6:41	5:44	6:18	6:0	5:48	6:15	5:16	
29 ...	5:22	6:40	...	...	6:0	5:46	6:16	5:15
30 ...	5:23	6:39	...	...	6:1	5:45	6:17	5:15
31 ...	5:23	6:39	...	...	6:1	5:45	...	...

The Markets.

TOP PRICES FOR FRUIT—ROMA-STREET MARKETS.

Article.	JANUARY.	
	Top Prices.	
Apples, Eating	9s.	
Apples, Cooking	7s.	
Apples, American, Eating ...	...
Apples, American, Green ...	...
Lemons, Italian, per 360 ...	22s.	
Lemons, Italian, per 180 ...	12s.	
Lemons, American, per 180 ...	10s. 6d.	
Lemons, New South Wales ...	8s.	
Oranges, Italian	10s. 6d.	
Oranges, Local	7s.	
Mandarins, Local (indifferent) ...	3s.	
Apricots, New South Wales, boxes (half-gincase) ...	6s.	
Apricots, Queensland, half-case ...	6s.	
Plums, half-gincase	5s.	
Peaches, half-gincase	6s.	
Nectarines, half-gincase	4s.	
Gooseberries, English	4s.	
Cherries ... ..	...
Passion Fruit, quarter-case ...	3s.	
Mangoes	4s.	
Pineapples, rough	3s. 6d.	
Pineapples, Queen	6s.	
Melons	8s. 9d.	
Rockmelons	4s.	
Bananas, per bunch	1s. 6d.	
Bananas, per dozen	2½d.	
Pears, Melbourne, per case ...	10s.	
Grapes, White, per lb.	2½d.	
Grapes, Black, per lb.	4d.	

AVERAGE TOP PRICES FOR JANUARY.

Article.		JANUARY.		
		Top Prices.		
Bacon	lb.	£	s.	d.
Bran	ton	0	0	10½
Butter, First	lb.	8	2	6
Butter, Second	"	0	0	10
Chaff, Mixed	ton	0	0	8½
Chaff, Oaten	"	6	2	6
Chaff, Lucerne	"	6	10	0
Chaff, Wheaten	"	5	13	9
Cheese	lb.	5	7	6
Flour	ton	0	0	8½
Hay, Oaten	"	12	10	0
Hay, Lucerne	"	5	10	0
Honey	lb.	4	7	6
		0	0	2½

AVERAGE TOP PRICES FOR JANUARY—*continued*.

Articles.							JANUARY.		
							Top Prices.		
							£	s.	d.
Rice, Japan (Duty paid)	...	...	...	...	...	ton	22	5	0
Maize	...	...	...	...	...	bush.	0	4	7
Oats	...	...	...	...	...	"	0	4	3 ³ / ₄
Pollard	...	...	...	...	...	ton	10	1	3
Potatoes	...	...	...	...	...	"	9	11	3
Potatoes, Sweet	...	...	...	...	...	"	6	0	0
Pumpkins	...	...	...	...	...	"	7	10	0
Sugar, White	...	...	...	...	...	"	21	3	9
Sugar, Yellow	...	...	...	...	...	"	17	5	0
Sugar, Ration	...	...	...	...	...	"	13	7	6
Wheat	...	...	...	...	...	bush.	0	6	4
Onions	...	...	...	...	...	cwt.	0	6	3
Hams	...	...	...	...	...	lb.	0	1	11 ¹ / ₈
Eggs	...	...	...	...	...	doz.	0	1	11 ¹ / ₂
Fowls	...	...	...	...	...	pair	0	5	0 ³ / ₄
Geese	...	...	...	...	...	"	0	7	1 ¹ / ₂
Ducks, English	...	...	...	...	...	"	0	5	4 ¹ / ₂
Ducks, Muscovy	...	...	...	...	...	"	0	6	1 ¹ / ₂
Turkeys, Hens	...	...	...	...	...	"	0	12	0
Turkeys, Gobblers	...	...	...	...	...	"	1	10	0

ENOGGERA SALES.

Article.							JANUARY.		
							Top Prices.		
							£	s.	d.
Bullocks	...	...	...	...	...	...	14	5	7 ¹ / ₂
Cows	...	...	...	...	...	...	10	19	4 ¹ / ₂
Wethers, Merino	...	...	...	...	...	...	1	4	6 ³ / ₄
Ewes, Merino	...	...	...	...	...	...	1	4	9
Wethers, C.B.	...	...	...	...	...	...	1	4	2
Ewes, C.B.	...	...	...	...	...	...	...	...	...
Lambs	...	...	...	...	...	...	0	16	4 ¹ / ₂
Baconers	...	...	...	...	...	...	...	...	...
Porkers	...	...	...	...	...	...	2	3	8
Slips	...	...	...	...	...	...	0	10	4 ¹ / ₂

Orchard Notes for March.

By ALBERT H. BENSON.

By the end of February the marketing of deciduous fruits is practically finished in Queensland, as, with the exception of a few varieties of late apples in the Stanthorpe district, and of persimmons in the various parts of the colony, this season is over.

The finish of the deciduous fruits, however, marks the commencement of the citrus season, and these fruits will be ready for handling in the earlier districts of the State during the month. This being the case, I take this opportunity of calling the attention of all citron-growers to the following very important considerations:—

FIRST: *The necessity for preventing this fruit from being destroyed by pests.*

In addition to the various scale insects attacking citrus trees and citrus fruits, the ripening fruit is likely to be destroyed by insects that either suck the fruit, such as the orange-piercing moths described by Mr. Tryon in the April number of this *Journal* for 1898; or by insects boring into the fruit, such as the yellow peach moth, sometimes known as the corn moth or borer moth, and the fruit fly. In order to obtain a good crop of marketable citrus fruit, these three pests must be carefully looked after, and every possible means must be taken to keep them in check so as to reduce the damage caused by them as much as possible. The orange-piercing moths can be destroyed in large numbers by the use of poisoned baits consisting of well-ripened Cavendish bananas impregnated with a solution of arsenite of soda, or a soluble arsenical poison, such as the well-known white-ant exterminators. These poisoned baits should be hung up among the orange trees, and they will attract and destroy large numbers of the moths. Ripe Cavendish bananas, unpoisoned, also act as an attraction to the moths, and they may be caught by means of an ordinary butterfly-net when sucking the fruit at night. The yellow peach moth, the second of these pests, is much more difficult to deal with, as it is not easily attracted or captured. It lays an egg on the skin of the fruit, usually where two fruits touch, or else in the folds of the skin, near the stem—in fact, in positions where it is not likely to be rubbed off. The egg hatches out into a minute caterpillar, which eats its way into the fruit, and increases in size till it is fully an inch long. Green fruits attacked by this insect rapidly turn yellow, and usually fall off, the loss in some instances being considerable, as the pierced fruit is useless, and rots rapidly. There are two remedies—first, the destruction of the young caterpillar as soon as it has hatched from the egg and before it has eaten its way into the fruit, and the second remedy is by the gathering and destruction of all fruits and seeds harbouring either the larvæ or pupæ of the insect. The destruction of the young larvæ or caterpillar is accomplished by spraying the infected trees with Paris green or arsenate of lime, as described in the October number of this *Journal* for 1900, under the article on citrus culture. The arsenical spray must be put on in the finest possible form so as to completely cover all the fruit on the tree, so that when the young caterpillar starts to eat the skin of the fruit, it will eat a minute quantity of arsenic and be poisoned. This remedy has proved very effectual in the treatment of the codling moth which attacks pomaceous fruits, and there is no reason why it should not be equally efficacious in the case of this insect as well. One spraying will not be sufficient, as the moths continue to lay their eggs for a considerable time, so that in districts where this moth is especially destructive to citrus fruits, spraying should be repeated at intervals of not less than three weeks.

The last and by far away the most destructive insect is the fruit fly. It attacks the orange whilst still quite green, and although the eggs seldom hatch out when laid in the unripe fruit, the injury to the latter caused by the puncture of the ovipositer of the fly tends to a premature ripening of the fruit and to its falling from the tree. Kumquats are especially liable to be attacked by the fly, and often form a very good trap for it, as if the tree is carefully watched and all infested fruit is gathered and destroyed, a large number of larvæ which would otherwise hatch out and destroy a quantity of fruit, would be prevented from so doing. As stated over and over again in these notes and in the articles on fruit culture appearing in this *Journal*, there is no better remedy for the fruit fly than the destruction of infested fruit, and the removal from the citrus orchard of all worthless and unprofitable fruit trees of all kinds which tend to harbour and breed these insects. Systematic and combined effort on the part of all fruitgrowers to carry out these recommendations will do more to keep this pest in check than anything else, and surely the citrus industry alone is worth taking a little trouble to save, as the quality of the fruit is recognised throughout Australia, and, it is to be hoped, will be shortly recognised in the Home markets as well.

SECOND.—The Peacock or Shoobridge case, which was accepted as the standard case at the Brisbane Fruitgrowers' Conference in 1897, and again at the Melbourne Conference in 1900, for all hard fruits, should be the only case used in which to market the fruit; as it is the only case at present in use in Australia in which it is possible to pack every grade of oranges, so as to have the fruit of even size throughout, and to have the case properly filled. Fruit, packed in this case, carried well to Vancouver, and no difficulty was experienced in packing the various sized fruits.

Strawberry planting can be continued during the month on same lines as recommended in the notes for February.

Where new orchards are to be planted, it is fully time to see about the preparation of the land, if this has not already been done, as it is advisable to get the land well sweetened before planting. Old worn-out trees and inferior trees that it is desirable to do away with, can be taken out during the month, the holes from which they have been taken being left exposed to the action of the air, so as to be thoroughly sweetened by the time a fresh tree is planted in the same place. Keep the soil well worked, and where weeds have got the upper hand during the previous month mow them down, and turn them under with the plough, a plough having a short digging mouldboard being the best for this purpose.

Farm and Garden Notes for April.

Field.—The maize crop should now all be harvested. Gather sorghum seed as it ripens. The main potato crop sown in February and March will be ready for earthing up a first or a second time. Cut and house tobacco as it comes to maturity. Sow lucerne and keep thoroughly clean what was sown last month. Sow oats, barley, rye, vetches, mangoes, and Swede turnips. April, May, and June are the months for sowing early and late wheat. Whatever variety is sown should be dipped in a solution of bluestone (sulphate of copper) at the rate of 1 lb. bluestone to 24 gallons of water. The hot-water treatment as previously described in this *Journal* is effective in destroying germs of smut and similar fungoid diseases. Do not sow too thickly. About half-a-bushel to the acre is sufficient, more on poor land and less on rich soils where the wheat is inclined to stool. On light, sandy soil the wheat should be rolled. On sticky land be cautious and roll only when the land is dry. Otherwise it will cake and must be harrowed again after rolling. When the wheat is 6 inches high, go over it with light harrows. If the autumn and winter should prove mild, and the wheat should lodge, it should be kept in check by feeding it off with sheep. Transplant roots of *Paspalum dilatatum*.

Kitchen Garden.—Hoe continually among the crops to keep them clean, and have beds well dug and manured ready for transplanting the vegetables now coming on. Thin out all over-crowded crops. Divide and plant out pot herbs, giving the plants a little water until established. Sow broad beans, peas, onions, radish, mustard, cress, tree and potato onions. Early celery should be earthed up in dry weather. Go carefully over the plants with your hands to prevent the loose soil getting between the leaves, one hand holding up the leaves, the other earthing round each plant. Fill up occasionally, and your celery will be ready in about two months. Transplant cabbages and cauliflowers. All vegetable seeds may be sown during this month.

Flower Garden.—The operations for the month will greatly depend on the weather. If wet, both planting and transplanting may be done at once, as there is some chance of getting the plants established before the winter sets in. Camellias, gardenias, &c., may be moved with safety. Plant out all soft-wooded plants, such as verbenas, petunias, penstemons, &c. Cut away all dead branches, hoe all borders, and stake plants that may require it. Plant bulbs, and mark them with a stick, so as not to destroy them in hoeing or digging. Sow annuals, as carnations, pansy, mignonette, daisy, snapdragon, dianthus, stock, candytuft, phlox, sweet peas, &c.

The Present Outlook.

It is cheering to be at last able to say with fair confidence that the long drought has broken up, although there are some districts where much more rain is wanted before farmers and graziers can feel themselves quite out of the wood. The marvellous recuperative powers of the soil, under the combined conditions of moisture, heat, and natural fertility, are shown in the abundant growth of grass and herbs in every part of the State. There were not wanting some who declared that never again would the grass grow in the West. They predicted that the cattle and sheep sent to the coast for agistment would never be taken back. How groundless were the fears of the pessimists, is now seen in the vast expanses of waving grasses of the good old types, such as the Mitchell and blue grasses, in addition to which there are several varieties of splendid fodder grasses entirely new to the districts in which they have appeared. Everything now points to a return of the years of plenty, and again the fertile wheat lands of the State will be placed under crop, the Department of Agriculture having taken steps to select, on behalf of our cultivators, the best available seed, and to supply it at cost price to those who had no other means of obtaining it. The dairying industry has certainly a difficult time ahead. The restocking of the dairy farms will be a slow and expensive process, but the patience and perseverance of the farmers will undoubtedly triumph in the end. The gravest situation is that of the squatters, who, in 1892, owned 21,708,310 sheep and 6,591,416 head of cattle. By the year 1901, the cattle were reduced to 3,772,707, and the sheep to 10,030,971. It is, however, generally believed that there are more cattle and sheep in north-western and south-western Queensland than the country is given credit for. Be that as it may, the ground-work of the pastoral industry has been so shattered that restocking and bringing up the number of sheep and cattle to the figures of 1892 will be a matter of years. Whence can stock be obtained? The other States will be unable to furnish a supply, for they have suffered heavy losses equally with ourselves. It means, then, that, to a large extent, restocking will be mainly a local business. Undoubtedly prices will rule higher, which is a grain of consolation. The average top prices for cattle were, in May, 1898:—Bullocks, £4 13s. 1d.; cows, £2 12s. 2d. In January, 1903, bullocks brought £19 6s., and cows £14. The highest prices were obtained in February, being £25 6s. 8d. for the former, and £17 13s. 4d. for the latter. That the proprietors of some of the meatworks are confidently looking forward to supplies is evidenced by the extension of the Burdekin Meatworks, and by the preparations being made by others for the purchase of stock. Turning from the pastoral industry, we find that sugar-growing is once more in the ascendant. Since the drought has broken in time to help along the young cane, the crop for 1903 is fairly assured. The completion of the Nambour-Dulong tramway will be instrumental in adding an additional 1,000 acres to the area under cane in the Blackall Range, all of which will be available for the Moreton Central Mill. Now that attention has been seriously drawn to water conservation, to the installation of pumping plants, and to irrigation by means of artesian bores, the occasional recurrence of a drought, which assuredly will happen in the future as it has in the past, will have no such dire effect upon the agricultural community as that of the past two years. Taking, then, a general view of the outlook for the coming year, we conclude that there is a good time in store for the State. Queensland has undoubtedly vast undeveloped resources which will be gradually brought to the front, as the finances at the disposal of companies and private speculators become liquid and available for profitable investment. With good seasons and increased population, she will speedily overcome all her difficulties and be the wealthiest State of the Commonwealth.

Agriculture.

BARLEY SMUT.

WHAT IS IT?—ITS REMEDY.

Every corn-grower is more or less conversant with the disease known as bunt in wheat, but few understand a somewhat similar disease—smut in barley—fewer still a remedy for the latter. So it comes to pass every harvest, when the fungoid foe has done its worst, questions are asked on all sides as to what can be done to save the damage. Too late. Nothing can be done then, but everything now, before we plant the seed. That well-known fungologist, Dr. C. B. Plowright, of King's Lynn, has shown us a remedy, which I will speak of by and by—a remedy for the disease which robs the barley-grower sometimes of a third of the value of the crop; and it is likely, if the disease could be stamped out, that barley-growing would become very much more popular, and certainly much more profitable in the land. There is, I am persuaded, no ground in the world more capable of producing prime malting samples than Britain, yet how many of the best are to-day imported from foreign fields? By setting determinedly to work to stamp out the devastating smut, at least a step will be made towards stopping imports and keeping English money in Englishmen's pockets.

WHAT IS SMUT?

It is a fungoid disease that attacks the ears of barley. It blackens the whole of the head, and is propagated by invisible spores, or seeds, which spread in uncountable numbers. Albeit, there are two kinds of this smut, known to fungologists as *Ustilago Jensenii* and *hordei*. The latter is the more important and harmful, yet appears the easier destroyed. Both leave the whole of the kernels or grains of barley converted into a sooty mass, yet while the one breaks up upon the slightest touch of wind or other pressure into the finest powder, the other—*Ustilago hordei*—holds its position. The former so falls away upon the slightest disturbance that there is nothing left for observation save the rachis, or continuation of the stem, to show where the ear was and where the disease flourished. But it is far different with the latter, which, for simplicity's sake, may in future be called the compact kind, for here the diseased grains hold to the ear, and, indeed, may not even show black in some cases, although well within the leaf sheath there is nothing but black soot. So in this kind it is the threshing machine that generally releases the spores, as is the case with bunted wheat. Again, the *Ustilago Jensenii*, or less subtle and less harmful variety, ripens the earlier—perhaps by 6 weeks. And here the whole mass of spores, as before intimated, disappears long before the reaping machine is set in, but that does not say they are done with. Still, it is obvious that the compact kind does the more damage to the sample, because it discolours the grain to a degree, and this I desire to make quite plain. Every farmer knows how the maltster grumbles and growls if the grains bear not that delicate creamy pale shade so characteristic of top samples. Stained barleys, it is true, may be caused by exposure to bad weather in harvesting, to heating in stack, or even to unkindness of soil, and over some of these causes we have no control. On the other hand, it may be, and often is, I say, due to smut, and that is the enemy we can defend our crops from, and we call for all our attention at the moment. Whether or not it was owing to Dr. Plowright being a Norfolk man, or to that country being a great centre for barley-growing, I know not, but reports through him were published some time back that the disease raged worse there than in other parts of England. I opine low-lying fen land is suitable for ripening of the spores. He gives a case where a farmer near King's Lynn had to sell his barley at 15s. per quarter, yet it was known that

the grain was of high quality when harvested, was harvested well, and indeed showed a good sample until actually put down the threshing machine. It was a case of the unbroken bodies of smut bursting upon passing between the beaters of drums in threshing and spreading over the whole bulk, discolouring the lot. This, I need scarcely point out, is a serious matter, and deserves thoroughly thinking out. The instance is well established, therefore we have to ask ourselves how many samples of bad colour are annually attributable to unkind land, how many to bad harvesting and to bad varieties, and how many really to this compact smut. And whatever may be the result of the inquiry, it behoves us to dress our seed, else we shall find the smut plague increase year by year, for as yet the disease appears young. In truth, Dr. Plowright declares he had not found or heard of barley affected by the compact smut until comparatively recently—say about 1890. But Mr. J. L. Jensen, of Copenhagen, and a celebrated American fungologist or two, reported instances of barleys being attacked across sea some time before that date. Remedial measures consist of dressing the seed with a solution of sulphate of copper, or immersing the grains in hot water. Jensen, in Denmark, and Swingle and Kellerman, in America—all three reliable authorities—have carefully worked out these remedies. The former plan is, they say, as easily carried out as dressing wheat for bunt, which process every farmer understands well enough. One pound of sulphate of copper they advise to 22 gallons of water, but, unfortunately, the quantity of the mixture to the 4-bushel sack of barley does not appear in the information before me. Probably, however, about 3 gallons of the solution to a sack of barley would answer, as evidently the object is to just bring every grain within reach of the liquid, so that the spores on the outer coat of grains be destroyed, just as this is necessary in dressing wheat for bunt. Of the second plan, Dr. Plowright observes as follows:—"There is a better method, but one which involves some little care and some little trouble, but has the effect of not only preventing the disease, but at the same time of causing the seed to germinate more evenly, and to produce a stronger crop, and this is by immersing the seed for 15 minutes in water raised to a temperature of 130 degrees to 134 degrees Fahr." I have not, however, had an opportunity of proving the usefulness of the two foregoing remedial measures, but it appears a matter of destroying the vitality of the spores, and sulphate of copper has great power in this direction, we all know, while water of a certain heat appears also reliable upon the authority of such men as we have no right to doubt. It strikes me, though, that the solution of sulphate is made remarkably mild—much milder than we use it for bunt in wheat, for instance. However this may be, great light is thrown upon an important matter that affects barley-growers in yet another direction, as follows:—It is pretty clear that the cereal may be discoloured by the compact smut that I have shown. How commonly the farmer observes that a certain sample is scarcely bright enough for the maltster, yet will answer well enough for seed. Such conclusion may prove ruination to a grower, as possibly the discolouration may be caused by smut spores, and if the seed be not effectually dressed the future crop would surely be tainted to a degree. The moral here is plainly writ. Sow no seed but such as is quite bright and free from stain that may arise from smut spores. That is, of course, unless proper remedial measures be used to purify it from the smut spores. There appears no doubt that propagation of the disease—the compact kind—is freely brought about by the spores being conveyed on the seed back to the land, just the same as bunt is propagated by seed wheat. Yet this can hardly be so as regards the other kind of smut in barley, *i.e.*, *Ustilago Jensenii*—the powdery kind. Why? Because this latter, as before intimated, is removed by the wind or other pressure before the barley ripens, and, as I have already shown, a considerable time before harvesting begins. Thus the myriads of minute fungoid spores fall back on the land—perhaps soon after midsummer—in a forward crop. Probably the best remedy here—for this kind of smut—is to give the fields as long an immunity from the cereal as convenient, so that the spores may lose

all vitality before the natural host of nurse plants—barley—put in an appearance.

I look upon the whole subject as fraught with exceeding interest to botanists or fungologists and farmers—one that pretty closely affects the latter in a pecuniary way, even so far as to make the difference between profit and loss in barley culture. And as no doubt this smut fungus, like most fungi, loves moisture, it is only reasonable to believe that proper draining of the land, cutting down hedges, and lopping up of trees, so that the barley crop gets plenty of fresh, dry air, is to a certain extent detrimental to the flourishing state of the disease, while early sowing to promote early harvesting—even before September [April in Queensland]—is recommended, as back-end fogs are kind to all moisture-loving fungi; it is the same with mildew in all crops, bunt in wheat and ergot in grasses, and that I say after studying parasitic diseases for many years.

Finally, barley grown under favourable conditions is by far the most profitable cult nowadays, so we need look to it that it has a fair chance.—“STUDIOUS,” in *Farmer and Stockbreeder*.

GRASS IN THE CENTRAL DISTRICT.

During last month, the seasonable rainfall brought up a splendid growth of indigenous grasses between Rockhampton and Longreach. Mitchell and blue grass grew to a surprising height, and all the desert and black-soil country brought forth three or four new descriptions of grass, which all proved to be excellent fodder grasses. Some of the farmers are taking advantage of the fine weather to get in as much as possible before it gets dry or is beaten down by heavy rain. So thick and heavy is the grass crop that 2 tons of hay per acre is being made. The flies are so much in evidence that it was impossible to work the horses in the wagons in the daytime. The work was, therefore, done by moonlight, when the flies had gone to roost. A considerable area of land is being placed under wheat this season; one farmer is putting 300 acres under cultivation. He bought $1\frac{1}{2}$ tons of wheat from the Rockhampton Milling Company at 6s. 9d. per bushel. All the cultivation ground is irrigated, consequently when the seed is sown the crop is assured. No rust has, as yet, made its appearance here.

COLONIAL WOOL REPORT.

Messrs. Buxton, Ronald, and Co., wool brokers, London, writing on 6th January, say—

The new year has opened with good prospects for all descriptions of wool. The strength developed at the last auctions here indicated more than a passing recovery, and has been succeeded by increased activity on all the wool markets of Europe. Trade is regarded as decidedly sound. Looms both in this country and abroad are for the most part well engaged, and, although the rising tendency of merinos has so far received but little encouragement in Yorkshire, circumstances have not favoured a passive attitude. Since our bi-monthly circular in November, fine wools have improved their position by 5 to 10 per cent. It would appear as if the shadow of 1900 has in some minds obscured the real issue raised at the present juncture in the wool trade. The question as to whether values of merino wool have reached the extreme limit of manufacturing capability may confidently be left for settlement to the near future, when the only safe factors—supply and demand—will reveal the true state of market requirements. The actual circumstances of business are reassuring from every point of view. Stocks of fine wools in Europe were practically exhausted at the close of 1902, and, as regards their replenishment,

the extensive mortality in flocks in New South Wales and Queensland must ensure a diminished supply thence during the present year. With regard to the precise position of values of Australian merinos, while prices of good grease approximate closely to September, 1899, currency, there is a distinct lee-way to be made up on scoureds and inferior grease.

As regards crossbreds, the fundamental alteration established in values at the sales here in November was sufficiently sudden to cause some misgiving as to its durability. Any evidence which has meanwhile been available concerning the trend of prices has not only been confirmatory of the increased favour extended to crossbreds as a class, but would seem not to exclude the possibility of some further improvement in medium and coarse grades. A 40s top which ruled at 7½d. in August is now quoted at 9½d. per lb., which represents an advance of about 33 per cent. And it is not alone in Yorkshire where this greatly increased demand for such wools prevails; both on the Continent and in the United States a large business in them is being put through.

Arrivals to date for the approaching series to begin on the 20th comprise—

Australasian.	Bales.	South African.	Bales.
Victorian ...	26,378	Cape, Western ...	9,720
New South Wales ...	21,191	Cape, Eastern ...	32,421
Queensland ...	9,942	Natal ...	5,143
South Australian ...	10,940		
West Australian ...	9,942		47,284
Tasmanian ...	77		
New Zealand ...	7,150		
	85,620	Total ...	132,904

of which 57,000 bales have been received in transit. An available total of about 120,000 bales is, therefore, not likely to be exceeded.

Since the above was written, we have the following particulars of the first series of home sales for 1903, as cabled to Messrs. Dalgety and Co. from their London house:—

13th January.—The list of arrivals for the first series of sales, commencing on Tuesday next, 20th instant, has been closed. New arrivals have amounted to 215,000 bales, of which quantity 82,000 bales have been forwarded direct to manufacturers at home and abroad. The balance, 133,000 bales, with 5,000 bales carried over from last series, make the total available for sale 138,000 bales. Private sales since the close of last series comprise only a trifling quantity.

20th January.—First series of wool sales opened with large attendance buyers; fair selection of wool; animated competition. As compared with the closing rates of the last series, merino wools are par to 5 per cent. higher; fine crossbreds, 5 per cent. higher; and medium and coarse crossbreds, 10 per cent. higher.

21st January.—Owing to a thick fog, no wool sales were held to-day (Wednesday).

22nd January.—Wool sales continue firmly, and lately reported rates are fully maintained.

23rd January.—Wool market very firm. There is an eager demand for lambs' wool, pieces, bellies, and locks at rising prices.

TRIAL OF POTATO DIGGERS.

A trial of potato diggers has been held under the auspices of the Royal Lancashire Agricultural Society, at Carr Hall Farm, Liverpool, which is tenanted by the Liverpool Corporation in connection with the Sewage Farm. There was splendid weather and a considerable attendance of Lancashire and North Cheshire farmers. The prizes were given by the Earl of Derby. The

expansive field in which the competition took place is very level and the soil remarkably light, almost peaty, so that the draught of the machines was reduced to a minimum. The judges were Mr. Moreton, Cheshire; and Professor Hele Shaw, of Liverpool. Mr. Mather, of Warrington, was the steward. Admirable field arrangements had been made by Mr. Philip Park, J.P., show-yard director of the Royal Lancashire, and Mr. Edward Bohane, the secretary. Each digger went over 3 drills, and labourers were then set to work to dig over 20 yards of each drill for buried potatoes, which were afterwards weighed. The first machine tested was that of Mr. James Ball, of Cheshire, but, unfortunately, it broke down at three parts of the first drill by a piece of iron getting into the cog of the main driving-wheel. The machine was doing its work remarkably well, clearing the drill and distributing the potatoes in a long straight line behind. The second machine tested was that of Messrs. Powell Bros. and Whitaker, of Wrexham. The dynamometer showed that this machine pulled 5 cwt. The weight of potatoes left in 60 yards of ridging was 41 lb. The third machine was one of Messrs. Ransome, Sims, and Jeffries, of Ipswich. It is a light, smart machine, and cleared the drill smartly and cleanly, distributing the potatoes uninjured and in close order ready for the pickers-up. This machine pulled 3 cwt., and the total weight of potatoes left in the 60 yards of drill scooped was 12 lb. The fourth was a machine of Messrs. Powell Bros. and Whitaker, to which had been attached an invention of Mr. P. Hesketh for delivering the potatoes clean and close. This machine pulled 6 cwt., and left 21 lb. of potatoes. A machine with a back delivery, invented by Mr. George Ledson, was also tested; the pull of this machine was $6\frac{1}{2}$ cwt., and the total weight of potatoes left was 30 lb. Messrs. Ransome, Sims, and Jeffries had another machine in the test, which pulled $6\frac{1}{2}$ cwt., and left 30 lb. A combined digger and gatherer by Messrs. Crowley and Co., of Sheffield, next attracted considerable attention. It was drawn by 3 powerful geldings. The drills were picked up clean enough, but there was a slight scattering. The gatherer worked admirably, the potatoes being delivered in baskets in absolutely faultless condition; not a single damaged potato could be found. So intense was the interest in this machine that the crowd closed in, and so hindered the judges in their duties. But this was soon remedied, and the ground roped off, when full opportunity was given of seeing the machine and fully testing its capabilities. The judges retired to the secretary's pavilion, and afterwards announced that the 1st prize of £20 was awarded to Messrs. Ransome, Sims, and Jeffries for the first digger they tried. The 2nd prize to Messrs. Powell Bros. and Whitaker. Both these machines worked admirably, and are simple in construction. The judge awarded the gold medal of the society to Messrs. Crowley and Co., whose machine justified the promise of its makers of delivering the potatoes undamaged.

COWPEA AS A FERTILISER.

The great value of the cowpea as a fertilising agent lies in its power to collect nitrogen either from the air, the soil, or from both. Scientific men are not at all clear on the source of collection, but the fact remains that, in common with several other legumes—such as peas, beans, lupins, and vetches—the cowpea collects large quantities of nitrogen, which is given to the soil when the crop is ploughed under. An acre of well-grown cowpea will amount in weight to from $1\frac{1}{2}$ to $2\frac{1}{2}$ tons, and when this mass is turned under it gives up 64 to 70 lb. of nitrogen, 21 to 25 lb. of phosphoric acid, and from 100 to 130 lb. of potash. The most barren soils may eventually be rendered fertile by green-manuring with velvet bean or cowpeas. It is merely a question of time. The turning-in should not be done during a very dry time, as harm instead of good will result, owing to the vines not decomposing. Discussing this subject, the *Farmer and Fruitgrower* says it is a question of the highest importance how to

retain this nitrogen, which is the most fugacious element in the whole list of fertilisers. An experiment at the Alabama station showed that cowpea vines gathered in October had from 1.45 to 2.62 per cent. of nitrogen, while if left lying on the ground until January they had only about 0.70 per cent. remaining. Hence the necessity of ploughing them under. And even this is not a positive guarantee of the retention of the nitrogen, since all varieties of soil seem to have slight affinity for nitrogen, and it is left to evaporate or wash away in the waters of drainage.

The only sure expedient, therefore, is to plant another crop to hold the fleeting element until spring by absorbing it into its own tissues. This retaining or cover crop may be rye, oats, or winter vetch, and the latter is, in some respects, the best of the three, because it is a legume itself, and would thus compound the interest, while the others would return only simple interest.

AGRI-HORTICULTURAL SHOWS AS EDUCATIONAL INSTITUTIONS.

By GEORGE SEARLE, Toowoomba.

The subject dealt with in this hurriedly—and imperfectly, as I well know—written paper, will, I think, command the attention of all those connected with shows, from whatever part of the State they may come. If the question had been asked of any delegate present at the late Agricultural Conference, “What is the object of your society in holding shows?” the answer would undoubtedly have been, “To educate the people, and to show what our district is capable of producing.” And yet, at the same time, I venture to say that there is not one who will assert that the particular show with which he is connected fulfils its intended purpose in educating the public to the extent possible.

Spasmodic efforts are sometimes made by committees in compiling their prize schedule to have exhibits in certain classes correctly named, but no instructions are given to the judge in those classes to withhold prizes in case of failure to comply with the conditions, and though a competent and conscientious judge would, if left to himself, decline to make an award, there have been instances where committees have declined to support a judge taking this course for fear of damaging their show another year, and by such a course of action nullifying the good likely to result from the imposing of the conditions, besides making themselves look ridiculous in the eyes of the judge and the public.

I am aware that the results of insisting on exhibits being named are often more amusing than instructive. To give an instance: At one of our Darling Downs shows last summer there was a prize offered for the best collection of apples, all to be named (correctly was not specified). During the first day of the show a man came to me and gave me an order for two dozen fruit trees, and included in the list were four “Uncle’s Favorite” apple. When I told him I did not know an apple of that name, he said it was a splendid looking apple, and that I would see it in the collection of apples that got the 1st prize. So the next morning I had a look at the collection referred to, and saw the apple named “Uncle’s Favorite,” which I thought I recognised as “Trivett’s Seedling.” There were others in the collection wrongly named, and there were at least two sorts of which there were two or more plates, but each plate bearing a different name. Such cases as this would, however, soon right themselves if judges were requested to make notes of such errors when they occurred, and were told to use their own discretion whether it would not be in the interests of all concerned if they were to refuse to award a 1st prize.

Judges do not care to take the initiative in these cases, but they should be encouraged to do so, and be supported by the committees concerned. Such a course of action would no doubt offend some exhibitors, for a time at least, but it would cause inquiry, which would result in rectifying a lot of mistakes, and

hence do a lot of good, and the offended exhibitor would probably be among the first to recognise the wisdom of the course adopted. It needs but a little reflection to see that a great deal of harm may result from exhibits being wrongly named. For instance, a person sees a fine exhibit of apples, with the name "Ribston Pippin" attached. By reference to the catalogue or prize card he finds that it is a product of the locality in which he resides, and very naturally concludes that it is a desirable sort for him to plant, and he gives an order for a number of trees, according to his requirements. After years of care and attention he finds that his trees do not produce a payable crop. He also discovers that the fruit they do produce is altogether different to the apples he saw exhibited. The result is, he blames the nurseryman for sending him an inferior sort instead of what he ordered, not knowing that what his neighbour named "Ribston Pippin" for exhibition purposes was wrongly so named. Instances similar to the foregoing might be multiplied, but it is, I think, unnecessary to give others in order to make my meaning clear.

There are, however, more important classes than fruit which ought to be the medium whereby valuable information is given.

This is essentially a new country, and new districts are constantly being opened up, and under present conditions each settler has to experiment for himself to find out what particular wheat, potato, or other product is most suitable for his particular soil or locality, whereas such an one could learn much of this if it were made a condition by which, and which only, an exhibit could compete for a prize, that there be attached to such exhibits—say in the agricultural section—the following particulars:—Correct name, when sown or planted, quantity sown or planted per acre, when harvested, weight of marketable crop per acre, description of soil, and whether manured or not, and what manure used, if any; and in the case of cereals, length of straw, its liability to rust or otherwise; and in the case of wheat only, its suitability for hay, or otherwise.

We all know that maize is one of our staple crops in Queensland, and we always see some very fine samples exhibited at our shows, but I would ask what information do such exhibits convey, beyond the fact that they are as fine samples as can be produced in any part of the world? Whereas to fulfil its purpose to the fullest extent possible, each exhibit ought to show its name, its height, when sown, and when harvested, the amount of grain sown, and the yield per acre, whether grown on new land or not, and whether the land was manured or subsoiled, and, lastly, whether that particular variety is suitable for late sowing, because it is well known that some sorts that are suitable for early sowing are comparative failures when sown for late crop.

I believe if cards were printed and supplied to exhibitors for them to fill in, the cards to be handed to the stewards for them to attach to the exhibits after they are judged, that exhibitors generally would fall in with the idea, and so make our shows more what they ought to be—educational in the highest sense of the word.

The stock-breeder is careful to ascertain the breeding of the sires to which he mates his mares, cows, &c., and it will pay the farmer to be equally careful, and study what are the best varieties to sow, and these periodical shows should be the best, or among the best, means for his doing so. In the vegetable and fruit classes there is equal necessity for improvement in the compiling of our prize schedules, which, in the light of the foregoing remarks, will suggest themselves to those concerned. In the floriculture classes—though of less importance commercially—there is plenty of scope for carrying out the ideas suggested.

It may perhaps be objected that competent judges are not always available. This would of course be a serious drawback to the carrying out of these ideas, but now that there are practical men in the Agricultural Department who are experts in their particular branches, and who, through the courtesy of the head of the Department, are always available for the asking, and who themselves are willing to act in such capacity when required, there is no reason why we should continue to conduct our shows in the comparatively useless manner as

heretofore. If a beginning were made in a few classes in each section, I feel sure the results would be such as to reduce a gradual increase of the number, and the ultimate adoption of the system generally, and that more interest would be taken in our shows by farmers and others, for the reason that they could not fail to be instructed as well as interested.

If this short paper, imperfectly compiled and hurriedly written, should prove the means of inducing even one committee to make a start in the direction indicated, the writer will be pleased, but if it results in the general adoption of the system he will be intensely gratified.

SIGNS OF PROSPERITY.

The Chinese have a great reverence for agriculture, and they have many wise saws, trite sayings, and proverbs having reference to the industry. We came across the following very apposite little poem in one of our exchanges lately, which is quite applicable to our own country:—

Where spades grow bright, and idle swords grow dull;
 Where gaols are empty, and where barns are full;
 Where field paths are with frequent feet outworn,
 Law Court yards weedy, silent, and forlorn;
 Where doctors foot it, and where farmers ride;
 Where age abounds, and youth is multiplied;
 Where poisonous drinks are chased from every place;
 Where opium's curse no longer leaves a trace,
 Where these signs are, they clearly indicate
 A happy people and a well-ruled State.

REPORT ON WORK, QUEENSLAND AGRICULTURAL COLLEGE, JANUARY, 1903.

The earlier part of this month set in with a nice rainfall, and promised well for a good season; all our crops looked remarkably well, and high yields were expected:—The total rainfall was 3·68 points, as follows: 10th, 2·66; 13th, 0·50; 17th, 0·21; 22nd, 0·30; 31st, 0·01. Notwithstanding the fact of our having had good rains in the earlier part of the month, the corn crop suffered later on from the effects of the extreme heat. This may be attributed to the fact that the fall was not sufficient for the requirements of the subsoil, the result being that the moisture in the surface soil was quickly exhausted. During the month all hands were heavily taxed to keep pace with the work on hand. Considerable demands were also made for information in connection with the conservation of the early crop of maize (which, owing to the dry weather, failed to produce grain), both by letter and by personal visits by farmers from all the principal agricultural centres in Southern Queensland.

FARM.—Planted section 1 (5 acres) with cowpea and velvet beans; section 10 (5 acres) with broom millet and orange amber cane. Maize was planted as follows in the Gatton paddock (newly cleared land):—1 acre, White 90-day; 17 acres, Argentine; 3 acres, Early Mastodon; 2 acres, Hawkesbury Champion; total, 23 acres; also, 7 acres amber cane. Cut and stooked cornstalks, 5 acres, section 6, for experimental purposes; cut, carted, and converted into ensilage 34 tons green maize from sections 2 and 9; the total cost of cutting, hauling, and placing in the silo was 3s. per ton; 34 tons 10 cwt. of lucerne hay was obtained from section 13 (40 acres); from 12 acres in the creek paddock, 8 tons 5 cwt.; and 12 acres in the garden paddock, 7 tons—a total of 49 tons 15 cwt. from 64 acres. This return is somewhat low, owing to the effect of the dry weather. Two and a-half acres of *Paspalum*

dilatatum grass yielded 2 tons 10 cwt. of beautiful hay. We cut and saved in the form of hay 12 tons of grass; the old shelter sheds were also covered with bush grass. A good deal of time was given to cutting burrs and other noxious weeds; also cutting chaff, firewood, &c.

GARDEN.—Orchards and vineyards have been thoroughly cultivated. The creek vineyard yielded a fair crop only, the losses through drought and hail having been very heavy. In the vegetable garden a great deal of ploughing and harrowing has been done, also weeding where the above operations could not be carried out. Seed beds have been dug up, and lettuce, cabbage, onions, beans, &c., sown. General sowings will be made as soon as the land is in good order. All the summer vegetables, with the exception of tomatoes, which never recovered from the hail, have produced good crops.

DAIRY.—During the month 1,280 gallons of milk gave a return of 560 lb. of butter, and 631 gallons returned 687 lb. of cheese; 176 gallons were supplied to the dining-hall, 46 gallons to officials, and 220 gallons were fed to calves. The average number of cows milked daily was 50. The herd was fed on natural pastures only. The increase for the month comprised 1 Shorthorn and 1 Ayrshire; we disposed of 1 Jersey bull. The stock are now in splendid condition, and giving good returns.

PIGS.—The increase comprised 12 Berkshires. We disposed of 9 Berkshire sows and 3 boars, 1 Mid.-York sow and 2 boars for breeding purposes; also, 8 weaners and 1 crossbred sow.

SUBTERRANEAN WATER.

Throughout the length and breadth of Queensland the subject of subterranean water for irrigation purposes and town supplies is exciting the public mind in a remarkable degree. This may be due to several causes. First, the long drought; secondly, the practical demonstration by Dr. Maxwell of the existence of large bodies of water other than artesian in localities where water was supposed to be non-existent; thirdly, the discovery of ample supplies in similar localities by means of the divining rod. As far as the latter mode of detecting underground water is concerned, there are more sceptics than believers in the method. But where proof has been given that certain persons undoubtedly have the gift of discovering water by this simple means, incredulity becomes simply the effect of ignorance. We, ourselves, have seen medicinal springs discovered in Switzerland, at Rossinières, near the Lake of Geneva, by the help of a willow fork. We have since then seen two springs discovered at Oxley Creek in 1862—one, a mineral spring in Mr. Donaldson's paddock, by the late Rev. Wm. Gray. The other in our own orangery, only 100 yards from the former, but yielding perfectly sweet water. Prior to these discoveries people had to travel over $1\frac{1}{2}$ miles for water for domestic purposes. The most successful work in the way of finding water by the divining rod has been done by Alderman F. G. Palethorpe, of Toowoomba. In 1901, the municipal authorities of Toowoomba decided that a fresh water supply was urgently needed for the town, and schemes were proposed, the cost of which was estimated at from £110,000 to £250,000. Mr. Palethorpe offered to find a supply which would be ample for all purposes. The offer was accepted, and a shaft was sunk at the spot indicated. At 60 feet a supply of beautifully clear, pure water was struck within 16 yards of a well, the total depth of which was 90 feet, and which had gone dry. This new supply not only has supplied the whole of Toowoomba during the big drought of 1901-2, but it has increased in quantity by means of tunnelling, till now the yield is 336,000 gallons per day. Again, in 1902, the council engaged Mr. Palethorpe's services, and, as a result, a shaft 8 feet by 4 feet was sunk on what

Plate XX.

USING THE DIVINING ROD.

is known as the "East Swamp." This was sunk to a depth of 80 feet, when two 2½-inch bores were put down for 16 feet further—a total depth of 96 feet. Then a tremendous supply was struck of 432,000 gallons per hour. At Talgai West, the same success attended the use of the divining-rod in Mr. Palethorpe's hand; the manager, Mr. Aubin Dowling, stating that that gentleman's reputation as a finder of underground streams is beyond dispute. On Jondaryan Station, four bores and two shafts were sunk at spots indicated by the rod; and all were successful, as is testified by the manager, Mr. Charles Williams. At Clifton, Spring Bluff, Gowrie, and other places on the Downs, water has everywhere been got by this means. Messrs. Graves Bros., of Gowrie, declare that they would recommend anyone putting down a well to first get the assistance of a diviner. Facts are stubborn things, and these are facts which cannot be disputed, as they can be verified without leaving Toowoomba, and are vouched for by well-known citizens, squatters, farmers, and others in various parts of the South of Queensland.

"Sylvan," writing on the subject in the *Sydney Mail* in August, 1902, says:—

Among the hoary, time-encrusted controversies that provided intellectual refreshment for successive generations that ringing round the divining-rod has occupied a place of honour. A very early description of the rod runs that it was first styled, in classic records, the Caduseus or Wand of Mercury, and subsequently the Rod of Aaron, and was usually adopted in the form of a forked branch of hazel and sometimes of brass or copper. It is probable that many profound humbugs acquired local fame and gathered in wealth in kind and in coin from the credulous, who believed that the power of the rod was a supernatural agency for the discovery of water and minerals. Agricola is said to have believed in its supernatural powers, and other men in several ages who have pretended to scientific knowledge have been convinced that in the hands of certain persons the divining-rod had powers. Dr. Herbert May, in 1847, and again in 1861, in a work entitled "On the Truth Contained in Popular Superstitions," gave a number of curious illustrations of the art of finding water and minerals by a rod supposed to be possessed by 1 in 40 of the Cornish miners.

At the present day there are many who believe in the scientific principle, which is but vaguely understood; while there are many more who scoff at the divining-rod, its preceptors, and all their works. Some day scientists will devote close research and practice to the question, and possibly the exact extent of the power of the magic wand may be determined. Meanwhile scoffers scoff because they have not had a practical example of the uses to which the rod is put placed before them. So far there are several questions concerning the practice which must remain unanswered. For instance, it has not been decided whether the rod will not sometimes pass over water without indicating its presence, and whether it will indicate water at great depths. So far as minerals are concerned, the power of the rod is very problematical; the most that can be said in favour is that precious metals have been discovered through its agency. We are all aware that men have claimed to discover all minerals at all depths, and I have heard others assert vehemently that if they pass over water with a green twig in hand the twig is sure to dip if the water be half-a-mile beneath the surface. Other professors of the kind one meets in back-block bars tell one that not only do they place water, but they are also able to decide the depth at which it will be found. They tell graphic stories in illustration, and you get the entertainment for the paltry price of a pint of the local beer. Moreover, you may have a great deal more of the same brand of story for the mere outlay in further beer. Doubtless, the most entertaining information concerning the power of the rod in all ages has been prompted by superstition, or the equivalent of colonial beer, which is an equally potent incentive to the imaginative retailer of polite fiction. But there is an underlay of hard practical truth in it all; the trouble of those who would make

some use of the influence of the rod is to decide to what extent that influence may be relied upon, and this point can only be reached by practice.

Up to last spring I was one of the army of scoffers who made merry at the expense of the devotees of the rod. I happened to be on Belltrees Station that season, and Mr. H. L. White suggested that a trial should be given to the divining-rod. Previously I had seen illustrations representing men walking about with forked twigs elevated in their hands, the men looking extremely important, the twigs very unyielding. Now I was to have a live illustration. Mr. White cut a forked twig from a willow, elevated the forked end, and walked into the orchard. Presently the point of the fork began to dip, and gradually it fell lower and lower, till it pointed to the ground. I knew that Mr. White would not take to monkeying with a twig for the purpose of making us feel foolish, so I examined it closely. I saw that the twig had turned down while Mr. White held the ends firmly, the wood being twisted in his hands, and there was no doubt that he had been unable to prevent the willow from going over, and pointing at a certain spot. He handed it to one of those present, who held the twig according to directions, and after walking some distance came back to the spot where it had dipped. But the twig remained erect, and the experiment was a failure. I took the twig in hand, and walked over the same course. To my surprise the end began to fall over when I approached the spot in the orchard, and, though I held tight and hard, it dipped and dipped till it pointed to the mark made by Mr. White after his trial. Mr. White then informed us that there was water under that spot at a depth between 30 and 40 feet. This had been proved by a well on the line of the underground watercourse. We also learned that other wells had been put down on the authority of the rod, and water had been struck. The power is apparently possessed by all of Mr. White's brothers, and one of them has a well of water on his station, 80 feet deep, discovered with the instrument.

Since that time I have tried the twig, or rod, in several places. On Durundur Station, north of Brisbane, I marched nearly a mile with a rod, then it dipped. I walked away from the spot in several directions, and on returning to it each time the twig dipped again. The photographs reproduced with this article show the positions in which the rod is held. First, the ends are held, the point of the fork being downwards and the thumbs upwards. Then the point is thrown upwards, as in the second position. Now the nails of the thumbs are pressed against each other, and the operator walks on. The hands must touch at the thumb nails only, for if flesh contact occurs the rod will refuse to dip or go down in a very uncertain way. When the operator walks over water he feels what seems to be a very slight magnetic current in the twig. Then he finds that, hold as tightly as he may, he cannot keep the fork in an upright position. I am, of course, writing of one in whose hands the rod works sympathetically. The photographs were taken in the Botanic Gardens, Sydney. . . . My advice to those who feel interested in the great divining-rod controversy is to put it to a practical test. The material is cheap, and the process simple.

PICKLED MUSHROOMS.

As mushrooms will soon be much in evidence, especially on dairy farms, we give the following recipe for pickling "buttons":—

See that the mushrooms are freshly gathered, and throw them into milk and salted water. Stalk and skin them, take them from the first and put them into fresh milk and salted water, with an onion stuck with cloves. Allow them to boil for three minutes, and then drain on to a flannel. Take as much vinegar as will cover the mushrooms, throw into it 2 oz. of mixed spice, ginger, mace, nutmeg, and whole pepper. Pour it into a stewpan and set it over the fire till it boils, then take it off and stir into it 2 oz. of sugar. When cold, pour over the mushrooms and tie over bladder and brown paper.

Dairying.

THE DAIRY HERD.

QUEENSLAND AGRICULTURAL COLLEGE.

RETURNS FROM 1ST TO 28TH FEBRUARY, 1903.

Name of Cow.	Breed.	Date of Calving.	Yield of Milk.	Per cent. Butter Fat, Babcock Test.	Commercial Butter.	Remarks.
			Lb.		Lb.	
Annie Laurie	Ayrshire...	10 Aug., 1902	519	4.0	23.25	
Annie	"	1 Nov. "	425	4.1	19.51	
Blink	"	28 April "	67	6.0	4.50	Dry, 14-2-03
Bonny	"	15 May "	392	3.8	16.68	
Laura	"	12 July "	554	3.8	23.57	
Lottie	"	17 June "	359	4.0	16.08	With first calf
Laverock	"	14 Aug. "	572	3.7	23.70	
Lass	"	11 July "	510	4.0	22.84	
Linnett	"	10 Sept. "	638	3.6	25.72	
Lowla	"	31 Oct. "	444	3.8	18.89	
Lavina	"	5 Sept. "	661	3.7	27.39	
Ruby	"	24 July "	544	4.0	24.37	
Rosebud	"	4 Dec. "	780	3.8	33.19	
Ruth	"	18 Dec. "	592	3.8	25.19	
Ream	"	10 Jan., 1903	579	3.7	23.99	
Renown	"	21 April 1902	416	3.8	17.70	
Ream Routhie	"	5 Feb., 1903	476	3.6	19.19	
Lena	"	26 Feb. "	38	3.8	1.60	
Leesome	"	27 Feb. "	28	3.6	1.12	
Carrie	Jersey	15 Sept., 1902	488	4.5	24.59	
Effie	"	17 Nov. "	667	4.8	35.85	
Eileen	"	4 Nov. "	465	5.0	26.04	
Ivy	"	24 Oct. "	470	4.5	23.68	
Jersey Belle	"	17 Jan. "	550	4.4	27.10	
Playful	"	3 July "	536	4.5	27.01	
Stumpy	"	17 Mar. "	393	6.5	28.61	
Sweet	"	6 June "	280	5.0	15.68	With first calf
Damsel	Holstein	29 July "	132	4.0	5.91	
Dora	Shorthorn	12 Jan., 1903	621	3.8	26.42	
Guinea	"	9 June, 1902	492	3.7	20.38	
Kit	"	27 Nov. "	659	3.9	28.78	
Lucy	"	14 Aug. "	542	4.2	25.49	
Louisa	"	3 Jan., 1903	654	3.8	27.83	
May	"	26 June, 1902	384	4.0	17.20	
Nestor	"	31 July "	639	4.0	28.62	
Queenie	"	2 Sept. "	552	3.8	23.49	
Rose	"	10 April "	394	4.1	18.09	
Violet	"	6 Dec. "	613	3.7	25.40	
Winnie	"	17 June "	434	3.6	16.49	With first calf
Fancy	South Coast	19 Jan. "	422	4.4	20.79	
Grace	"	1 Sept. "	473	3.8	20.13	
Topsy	"	4 Oct., 1901	337	4.0	15.09	
Drone	Grade Shorthorn	12 May, 1902	320	4.1	14.69	With first calf
Lemon	"	18 June "	489	3.6	19.71	With first calf
Peggie	"	19 April "	365	4.1	16.76	
Princess	"	5 June "	368	4.0	16.48	With first calf
Rowly	"	22 April "	375	3.9	16.31	With first calf
Rosella	"	1 Dec. "	490	3.6	19.75	
Brindle	Grade Jersey	6 June "	457	4.2	21.49	With first calf
Witch	"	13 May "	424	4.0	18.99	With first calf
Mona	Holstein Sh'rth'n	3 June "	554	3.7	22.95	With first calf
Reanie	"	7 Mar. "	494	4.0	22.13	With first calf
Night	Holstein Devon...	20 April "	367	4.5	18.49	With first calf
Angel	"	1 Feb., 1903	480	3.8	20.42	With first calf

The herd was fed on natural pasturage only.

EXPERIMENTS IN BUTTER-COOLING.

A communication from the Department of Mines and Agriculture of New South Wales has been received by the Hon. the Secretary for Agriculture of this State, covering a very interesting report by Mr. O'Callaghan, Dairy Expert to the New South Wales Department of Agriculture, of experiments made by that gentleman to ascertain the best temperature at which to ship butter to England. The experiments were carried out in conformity with a resolution passed at the Agricultural Conference held in Hobart in January, 1902, to the effect "That the several States interested in the shipment of butter should be requested to experiment at their freezing works in order to ascertain the best temperature at which to ship butter to England."

DETAILS AND RESULTS OF EXPERIMENTS.

Marks and Numbers.	Flavour when First Judged.	FLAVOUR—SECOND JUDGING, SIX WEEKS LATER.	
		Butters held at a range of 15 to 22 degrees Fahr.	Butters held at 32 to 35 degrees Fahr.
A 1	40	37	35
" 2	42	42	40
" 3	42	42	42
" 4	44	41	33
" 5	43	40	38
" 6	40	36	30
" 7	41	38	38
" 8	45	41	37
" 9	48	41	41
" 10	41	41	40
B 1	40	40	36
" 2	43	42	38
" 3	44	42	41
" 4	44	38	37
" 5	44	40	37
" 6	39	35	33
" 7	45	42	40
" 8	36	35	35
" 9	40	40	40
" 10	42	40	40
Averages ...	42.15	39.65	37.55

CONCLUSIONS.

1. The results go to show that on the average butters keep better at 22 degrees Fahr. or under than at 32 degrees Fahr. to 35 degrees Fahr. The difference works out at 2 points in flavour, which, in England, would mean a difference of about 2s. per cwt. in the values of the butters.

2. The butters held at the lower temperature lost, during the six weeks, on the average $2\frac{1}{2}$ points each in flavour, while those held at freezing point or near it lost $4\frac{1}{2}$ points on the average.

3. Some butters keep as well at a temperature of 32 degrees Fahr. as at one of 22 degrees Fahr.

4. Pasteurised butters keep better at the higher temperature than ordinary butters. This is shown by butters marked 3, 9, and 10 A, and 3, 9, and 10 B. These butters kept quite as well at 32 degrees as at 22 degrees Fahr. in most cases, and when a difference was noticeable it was a very slight one.

I might add that this is the third series of experiments of this kind, others having been conducted two years ago with practically similar results.

INTERNATIONAL DAIRY CONGRESS.

We have received a circular from the president of the National Dairy Society of Belgium, announcing that that society has determined to organise an international congress to take place in Brussels about the month of September, 1903. The congress will take into consideration many questions affecting the dairying industry, three of which will take precedence as being of international importance. These are: An international convention for the suppression of fraud in the butter and margarine industry; the hygiene of milk and milk products; and the creation of an international dairy association, which would undoubtedly find an antidote to fraudulent business in dairy products. Communications will gladly be received from those connected with the dairying industry in other countries, offering suggestions on the subject of an international dairy association, and also on any other subjects connected with the industry which they would like discussed at the proposed congress.

Communications may be addressed to Mr. Arm. Collard Bovy, General Secretary of the Société Nationale de Laiterie, Square Marie Louise, 56, Brussels, Belgium.

Attached to the circular is a form to be filled in by anyone approving of the scheme, to the following effect:—

The undersigned [name and profession here] living at [give address] approves of the idea of the organisation of an International Dairy Congress, and wishes to receive further information about it. He thinks the following question might be put on the business-sheet [question here].

[Date]

[Signature.]

The above form to be sent as soon as possible to the general secretary.

ANGORA GOATS.

The establishment of flocks of Angora goats in Queensland makes very slow progress. Why this should be so can only be attributed to the greater cost of the Angora as compared with the common goat, of which large numbers are kept both on the coast and beyond the Main Range. They are just as easy to keep and cost as little to feed as the latter, and there is no comparison between the profit derived from their mohair, skins, milk, and flesh and the like products of the common variety. Although so much has been written on the subject in this *Journal*, and in nearly every stock and agricultural journal in Australasia, people have not yet got to fully understand the value of the Angora. Mr. H. Missing, of Talegalla, Tiaro, near Maryborough, has established a nice herd, having bought a flock from Messrs. Spencer Bros., of Kilkivan, amongst them a fine purebred buck, originally obtained by those gentlemen through the Department of Agriculture. This animal, which is here illustrated, is named "Wellington," and Mr. Missing speaks very highly of him. The herd having only recently been formed, no results can yet be shown, but, through the owner's courtesy, we shall be able to give our readers full details when shearing and kidding come on. Two more purebred bucks are being imported from Adelaide for the same herd. Of the herd itself, Mr. Missing says the goats give no trouble at all. They are put into a small paddock at night. The paddock is fenced with four wires, three barbed and one plain, 9 inches apart, and although this fence is only 3 feet high they never attempt to jump over; but if crowded up in going in or out a few will sometimes squeeze between the wires. At first, wire-netting was used, but the goats found the meshes so convenient for polishing their horns and scratching their heads that they soon reduced it to a ragged, dishevelled condition. In the morning they feed for an hour or two, then camp, have a drink, and feed again; never going a mile away, and invariably come up to the paddock about an hour before sundown. Of course, they were shepherded for the first few

weeks after they arrived at the station, but now they just go where they please, and, as they all stick together, they are no trouble whatever.

They appear to be fond of chewing extraordinary substances, such as bits of jam-tins and oyster-shells. One of them was enjoying a rich feast on a succulent piece of corrugated iron, and when the owner stooped down to take it from her she snatched his straw hat off his head, and used it as a dessert.

We hope to hear in good time that the flesh of the Angora has met with the appreciation it deserves. There is no mutton to equal it for food, as it has a distinct flavour of that delicacy so much enjoyed by London aldermen—venison. No one who has once eaten goat venison will ever refuse to use it as a delicate article of food. It has no affinity with the ordinary goat's meat.

As to the profit to be derived from keeping Angoras: The milk is exceedingly rich, much more so than cow's milk. Goats do not suffer from any disease. There are no deleterious bacteria in the milk, which can at all times be used without fear of infection.

Mr. E. C. Kempe, of Warrina, Adelaide, owner of "The Central Australian Flock of Pure Angoras," running north of Lake Eyre (about 120 miles south of Birdsville in Queensland, says that his mohair, somewhat affected by the drought, sold in London at 1s. 2d. per lb. for fleece, unclassified; locks, 7½d. per lb. On another occasion best fleece mohair brought 2s. per lb. Turkish mohair, fair, at the same sales, sold at from 1s. 4½d. to 1s. 8½d. per lb. Skins of half-bred wethers sold locally up to 4s. 3d. each. Dressed skins, with fairly long hair, are worth 12s. 6d. each, and generally the skins range from 5s. to £1 each in price. Mr. Kempe's last account sales were 2s. 7d. for goat skins, ordinary. The mohair, locks and fleece, sold all round, in Adelaide, at 10d. per lb. This was the lowest value ever received by Mr. Kempe for his clips of mohair. That gentleman gives a short account of his flock in *Dalgety's Review* (February, 1903), from which we extract the following:—

Another year has gone by, and the experience of the twelve months has made me think more highly than ever of these animals and their great possibilities.

It is good to note the great interest taken in this animal during the last few months. Almost every stock journal or paper has some article on the subject, and yet the goat has been here all along, never properly understood, or success would have attended.

The management is not as easy as one would wish. Although good, they are "shy" mothers, and readily lose their kids if startled. I therefore have found that "mothering" is the most successful way; that is, keep all kids in, suckle them twice a day on to any goat, until strong enough to follow the flock. They appear then to do well, and help themselves. Class the goats at shearing time is all that is necessary. But use purebred sires only, never keep a cross-bred buck. You can soon have a good flock of Angoras, even by using the ordinary goat as "stock." The fifth cross will ensure a clip of good value, but keep the pure stock for sires.

In this dry climate these goats are simply wonderful. We practically live on "venison," and sell as much as we can spare at 4d. per lb.

During the last trying time beef was poor—goat meat was fat. It is also well acknowledged that goats are free from all disease; therefore their milk is the best that the world provides. It is richer than cow's milk, and there is no danger of that dread fiend "tuberculosis."

In February, 1901, we had 4 inches of rain, the following April 8 points; no more that year. This year we have had—in January ½ inch, in June ¼ inch, in September ¼ inch; that is, a total of 5 inches in twenty months. During this time the goats kidded twice, saved their kids, and many of the first kidding have been used as meat, saving the killing of cattle. This alone speaks well for the goat. All stations in dry parts should have them. They are no trouble to keep, and a supply of milk and meat is ensured at little cost. "No yard" is the rule, and little expense in the "shepherding." As for dogs, the goats can look after themselves.

MILKING COMPETITIONS

Conducted by the Instructor in Dairying, Mr. R. W. Winks, at the Drayton and Toowoomba Agricultural and Horticultural Society's Show, at Toowoomba, on the 24th, 25th, and 26th of February, 1903.

Owner.	Name of Cow.	Weight of Milk, in Lb.	Per Cent. of Butter Fat.	Commercial Butter, in Lb.	In Order of Merit.
<i>Trimmer.</i>					
Scottish Investment Company	Mermaid ...	25 $\frac{3}{4}$	2.8	.80	First day, 1.30
Rev. St. J. Pugh ...	Pretty Jane ...	12 $\frac{1}{4}$	3.9	.53	Second day, 1.78
Mr. A. Carrig ...	Maggie ...	20 $\frac{3}{4}$	4.0	.91	3.08
Mr. J. Jennings ...	Rose ...	17 $\frac{1}{4}$	3.8	.73	<i>Milkmaid.</i>
" " ...	Rosalie ...	17 $\frac{1}{4}$	4.4	.85	First day, 1.27
" " ...	Jubilee ...	15 $\frac{1}{4}$	3.1	.53	Second day, 1.76
Mr. F. Drew ...	Trimmer ...	19 $\frac{1}{4}$	4.0	.86	3.03
	Milkmaid ...	22 $\frac{3}{4}$	3.0	.76	
<i>Rosalie.</i>					
Scottish Investment Company	Mermaid ...	15 $\frac{1}{4}$	4.0	.68	First day, 1.39
Rev. St. J. Pugh ...	Pretty Jane ...	9 $\frac{1}{4}$	4.4	.45	Second day, 1.49
Mr. A. Carrig ...	Maggie ...	13 $\frac{1}{4}$	4.4	.65	2.88
Mr. J. Jennings ...	Rose ...	13 $\frac{3}{4}$	3.8	.58	<i>Maggie.</i>
" " ...	Rosalie ...	13 $\frac{3}{4}$	3.6	.54	First day, 1.56
" " ...	Jubilee ...	13 $\frac{3}{4}$	3.4	.51	Second day, 1.31
Mr. F. Drew ...	Trimmer ...	13 $\frac{1}{4}$	3.0	.44	2.87
	Milkmaid ...	16	2.9	.51	
<i>Mermaid.</i>					
Scottish Investment Company	Mermaid ...	17 $\frac{3}{4}$	3.2	.63	First day, 1.48
Rev. St. J. Pugh ...	Pretty Jane ...	12 $\frac{1}{4}$	4.0	.54	Second day, 1.34
Mr. A. Carrig ...	Maggie ...	16 $\frac{3}{4}$	3.9	.72	2.82
Mr. J. Jennings ...	Rose ...	18 $\frac{1}{4}$	3.2	.65	<i>Rose.</i>
" " ...	Rosalie ...	20 $\frac{1}{4}$	3.5	.79	First day, 1.31
" " ...	Jubilee ...	16 $\frac{3}{4}$	2.8	.52	Second day, 1.43
Mr. F. Drew ...	Trimmer ...	24 $\frac{1}{4}$	4.0	1.08	2.74
	Milkmaid ...	27	3.5	1.05	
<i>Jubilee.</i>					
Scottish Investment Company	Mermaid ...	16 $\frac{3}{4}$	3.8	.71	First day, 1.04
Rev. St. J. Pugh ...	Pretty Jane ...	9 $\frac{1}{4}$	4.6	.47	Second day, .97
Mr. A. Carrig ...	Maggie ...	12 $\frac{1}{4}$	4.2	.58	2.01
Mr. J. Jennings ...	Rose ...	14 $\frac{1}{4}$	4.8	.78	<i>Pretty Jane.</i>
" " ...	Rosalie ...	12 $\frac{1}{4}$	5.0	.70	First day, .98
" " ...	Jubilee ...	11 $\frac{1}{4}$	3.4	.44	Second day, 1.01
Mr. F. Drew ...	Trimmer ...	16 $\frac{3}{4}$	3.8	.70	1.99
	Milkmaid ...	18 $\frac{1}{4}$	3.5	.71	

HEAVIEST WEIGHTS OF MILK.

<i>Milkmaid.</i>	<i>Mermaid.</i>	<i>Trimmer.</i>
84 lb.	75 $\frac{1}{2}$ lb.	73 $\frac{1}{4}$ lb.

A NEW CURE FOR MILK FEVER.

The *Journal d'Agriculture Pratique* has an account of a new method of treating milk fever, discovered and practised by M. Knusel, a Swiss veterinary surgeon. Complete success is said to have been obtained by this gentleman's treatment, which consists of the injection of pure oxygen into the udder. M. Knusel had previously practised the comparatively new treatment with iodide of potassium, administered sometimes through the mouth, and at other times by injection into the udder; but he had found it to fail in the most serious cases, and he reckons that about 40 per cent. of the cows treated with it are lost. This insufficient success led him to try the oxygen treatment, which he had applied in twenty-two cases when he wrote his memoir of the method. Some of the cows were in an extremely dangerous condition, prostrated, insensible, and with laboured respiration, accelerated pulse, and paralysed tongue. Yet in thirty to sixty minutes after the injection they had so far recovered as to seek for food. Not one of them died. From six to ten litres of oxygen were injected, the gas being compressed to twenty-five atmospheres in an

apparatus obtained from the firm of Hauptner, of Berlin, which contains a valve for regulating the pressure. After washing and disinfecting a teat he introduced the teat probe, and slowly opened the tap to release the oxygen. When two quarters had been filled with the gas an assistant compressed the two teats, and by massage the gas was distributed through all the glandular tissues. This operation having been completed, it was repeated with the other two quarters, the whole work occupying only about ten minutes. Gradually the treated cow showed signs of recovery, first raising her head, next shifting into a comfortable position, and soon getting on to her feet. In two instances a relapse occurred, through the cows having been milked too soon; but a fresh insufflation of oxygen quickly restored them. These were the only accidents in the twenty-two cases. M. Knusel believes that if his treatment be applied soon enough it will be successful in all cases. He suggests as the explanation of the effectiveness of oxygen that the poison formed in the udder and passed into the general circulation of the animal is produced by micro-organisms, which may be anærobic, and therefore unable to live in the presence of oxygen.

FREEZING WITHOUT ICE OR ACIDS.

Ice does not begin to melt until the temperature is above freezing point, and, therefore, it cannot be employed in freezing liquids, &c., but only in cooling them. If any substance, however, is mixed with ice to cause it to melt more rapidly and at a lower temperature, a still more intensely cooling effect is produced. Such a substance we have in chloride of sodium (common salt). If 1 part of salt be mixed with 2 parts of ice, the result is a temperature 30 degrees below freezing point. As ice cannot always be obtained, especially in inland townships in the far West of this State, an efficient substitute must be found, and this substitute is a compound of various salts. Now, many of the freezing mixtures we read of in books are really not freezing, but merely cooling mixtures not much more effective than the time-honoured water-bag of the bush. To freeze a liquid the temperature must go to 30 degrees Fahr. below freezing point (32 degrees).

Now, here is a good freezing mixture:—1 lb. muriate of ammonia or sal ammoniac finely powdered is to be mixed *intimately* with 2 lb. nitrate of potash, or saltpetre, also in powder. Call this mixture No. 1.

To form No. 2, take 3 lb. of the best Scotch soda, powdered. Now, to use, an equal bulk of both No. 1 and No. 2 is to be taken, stirred together, placed in the ice-pail, surrounding the ice pot, and rather less cold water poured in than will dissolve the whole. Suppose a quart of each has been taken, it will take about a quart of water to dissolve them, and the temperature will fall to about 30 degrees below freezing. Only use just the amount of water required to dissolve the powder, otherwise energy is wasted in cooling down the excess of water instead of the substance we want to freeze. The ice-pail should be made of wood, and the ice-pot in which the substance to be frozen is placed should be of pewter, and surrounded nearly to the top with the mixture.

Nitrate of ammonia added to twice its weight of freshly crusted washing soda and an equal quantity of the coldest water you can obtain will make such a powerful freezing agent that the temperature will fall to 40 degrees below freezing. This is by far the most efficacious of all freezing agents that can be made without ice or acids.

There is a mixture greatly used in India. It consists of two powders, the first of which is composed of 1 part by weight of muriate of ammonia or sal ammoniac powder, and intimately mixed with 2 parts by weight of nitrate of potash or saltpetre. This mixture, used alone, will only cool. The second powder is made of the best powdered Scotch soda. Both must be kept in a cool, dry place in separate jars—airtight. To use the mixture, mix them together by stirring, and immediately introduce them into the ice-pail. Pour on just sufficient water to dissolve them—a pint measure of each will require a pint of water.

The Horse.

IMPERIAL HORSE-BREEDING FARMS IN QUEENSLAND.

The following notes have been supplied to the *Scottish Farmer* by a gentleman lately returned from a visit to Queensland:—

Much has been written about establishing horse-breeding farms in Australia by the Imperial Government. Such a proposal is scarcely likely to find favour with the British taxpayer, and those best qualified to judge say that it would not result satisfactorily. The entire cost would be formidable, and the annual outlay considerable, and, as no horses would be available from these farms for four or five years, the cost of the first 5,000 would be abnormally high. It must also be recollected that half the increase would be mares, which, though used, are not so well adapted for remount purposes as geldings.

There has been little inducement to produce high-class horses of the weight-carrying hunter or hack description of late years in Australia, seeing that the prices ruling for the past fifteen years have been abnormally low. But although in shape and appearance the Australian horse may not be equal to that of fifty years ago, or even twenty-five years ago, the quality of the horses for hack work—as has to be done in South Africa—remains practically undiminished. During recent years horse-breeding has been carried on chiefly by station-owners, for the purpose of supplying themselves with stock horses, and also with horses for droving, &c. Experts say that the Australian stock horse is a wonder, inasmuch as he can stand an immense amount of work on the poorest quality of food. It is a common thing on cattle stations to see horses working day after day with no other food but what they can pick up during the night in scantily grassed horse paddocks. Drovers' horses are often three months on the road travelling with cattle, worked almost continuously, with no food but what they can gather during the night when hobbled out to graze.

From personal inquiry, I am satisfied that a good supply of horses exists in Australia, and that some thousands could be supplied from the Queensland State alone. Mr. Copeland, Agent-General for New South Wales, is responsible for the statement that at the beginning of 1900 there were 1,760,000 horses within the Commonwealth. He also remarked—"The supply is practically inexhaustible." This latter statement is confirmed by well-known Queensland men. Mr. Copeland, when expressing his views on the subject, said—"What we wanted was a contract, extending over a reasonable period, between the Imperial Government and the breeders."

The information supplied to me practically confirms the opinions above expressed, but I am of opinion that no contract is required. It would be sufficient for the Imperial Government to announce that they would purchase a certain number of horses annually for, say, seven years at £10 per head, delivered at their depôts. The price would be a payable one for the breeders, and would induce them to provide a suitable article. Dates could be fixed by the Government, say every two months, for the delivery of the number required.

But for the system to be effective the Imperial Government would require to establish depôts. These would not involve any large outlay, and the saving in cost, being the difference between the £10 proposed to be paid to the breeders and the £13 10s. lately paid to the contractors, would more than cover the cost of the depôt. In Queensland these depôts should be near the shipping ports connected with the interior by railways. The most convenient points in Queensland would be Ayr, near Townsville, Gladstone, or near Gladstone, and some place on the Southern railway lines near Brisbane. Each depôt would require an overseer and two assistants, and one or two Imperial veterinary surgeons would have to be stationed in the colony for the purpose of examining every horse submitted.

The great advantage of the *depôt* system would be that the horses would be handled, and gradually accustomed to food of the kind furnished on board the troopships. The horses would only be shipped if in good condition and fit for the voyage.

Practically no capital outlay would be required in the establishment of these *depôts*, and the following estimate for the annual cost has been furnished to me :—

Suitable paddocks could be rented at a very moderate annual cost. Land adequate to maintain, say, 500 horses could be rented at about £300 per annum. The staff, exclusive of Imperial officers, would cost £600 per annum. Forage and other items would mean a further outlay of, say, £800 per annum; the total cost for *depôt* being, say, about £1,700.

This estimate is considered sufficient to cover the cost of passing 800 to 1,000 horses through the *depôt* in the year. The number could, of course, be increased very considerably, and, if necessary, 500 or 600 horses could be shipped from each *depôt* every two months, but it has been impressed upon me that the cost would be less per head with the increase of numbers.

The result of my inquiries leads me to the conclusion that from Queensland alone the minimum supply would be 3,000 per annum, and this could be increased considerably if required.

One of the greatest advantages of such a system would be the inducement to Queensland horse-owners to breed and carefully handle the class of horses required. An intimation from the Imperial Government that they would purchase a minimum of 3,000 horses per annum in the State of Queensland during the next seven years would result in much greater attention being given to breeding and to the training of horses. The class of horse required for remounts would be equally suitable for station work in that country, so that practically the whole resources of the State in regard to the breeding of horses would be at the disposal of the Imperial Government, for the station-owners could just as readily breed horses suitable for remounts as any other description.

The initiation of such a policy as I have sketched out here would provide the War Office with a large supply of suitable remounts at a minimum of cost. If the system could be applied to all the Australian States, the supply would be practically inexhaustible. And one great advantage from the Imperial standpoint would be that no capital would be locked up. The station-owners would be the holders of the reserve supply. The Imperial Government would merely purchase a certain number annually, and the cost of the *depôts* would be distributed over the various shipments and form part of the cost of the horses.

And a further argument in favour of the system proposed is that a large reserve of remounts would be held in a British possession. Is it not better to ensure the Australian supply being at the disposal of the Imperial Government rather than that the nation should depend in war time for a supply from foreign countries? But in order to ensure such supply from Australia, it is necessary that the Imperial Government shall undertake to purchase a minimum number annually, say for seven years, at £10 per head, which is the lowest price at which horses of the required class can be produced, and which price is probably lower than they could be obtained at in any other part of the world.

MUSHROOM KROMESKIS.

Six mushrooms, 6 slices of bacon evenly cut, some browned crumbs or bread-crispings, 6 small round croûtes of buttered toast. Rinse and peel the mushrooms and remove the stalk. Season each well with pepper and salt. Wrap each in a slice of bacon. Place on a baking tin, with the folded edges of the bacon underneath. Bake in the oven for eight or ten minutes until the mushrooms are quite tender when pierced with a skewer. Lift quickly on to the buttered toast, which should be kept hot on the stove. Shake a few browned crumbs over each, and serve very hot.

The Orchard.

STRAWBERRY CULTURE.

March is the time for planting strawberries on the South-east Coast of Queensland, and February on the North Coast, but planting may be continued right through March for the varieties that produce early strawberries. For the later kinds, the planting season can be extended until about the first week in May. Strawberries do fairly well on various kinds of soil, such as light, sandy loam on ridges, chocolate loam on the scrub land flats, and also on the heavy black soil overlying a subsoil of clay on the ridges and mountain tops. The sandy loam is, however, the most suitable to the plant. The soil should be thoroughly broken up to a depth of 15 inches (18 inches is not too deep, provided no subsoil is brought up). The reason for this deep ploughing is that the strawberry is a deep rooter, the roots going down quite a foot; the plant also requires a great deal of moisture, which deep cultivation will ensure in ordinary seasons. The land, after being broken up, should be allowed to lie for some weeks in order to sweeten it, and also to permit weed seeds to germinate. Then, as the planting season approaches, plough the land to a depth of 7 or 8 inches; harrow and roll down fine. The plants should be mulched at the time of planting, or rather the land should be mulched before planting, and it is easy to put in the plants by slightly moving the mulch and making the dibble hole beneath it.

About a week after planting, go carefully through the rows, which should be from 20 to 36 inches apart, with a distance of from 9 to 16 inches between the plants, according to whether hand or horse cultivation is to be done. The closer distances are for hand labour. Planting should be done, if possible, during showery weather. Should the weather be dry, plant towards evening when the sun is low, and give a pint of water to each plant. When the water has soaked away, break the soil round the plants to prevent evaporation. Should the weather continue dry, water every two days for the first week, after which one good watering a week will do till the plants are rooted. When lifting the plant, try and keep a ball of earth adhering to the roots, which will considerably help the rooting. Do not allow the plants to be exposed to sun and wind, but cover them with a wet bag until they are safe in the ground. Spread the roots well out, and do not plant too deep. The crown should just be shown peeping over the ground. About five or six weeks after planting, runners will be thrown out. Be careful to pull these off as they appear, for if left to grow the plants will be weakened, and they will not bear so heavy a crop as they otherwise would. To grow good berries, the land can hardly be too rich, although the strawberry is not an exhausting crop, but there must be plenty of food available for the growing crop, otherwise the fruit will be small and the plants stunted. Should the soil be at all poor, use the following manure per acre:—

Half-ton bonedust, 1 cwt. kainit, and 1 cwt. sulphate of ammonia or nitrate of soda.

The bonedust and kainit must be well ploughed in about two months before planting, so that there may be plenty of plant food available as soon as the roots get to work.

As to the

VARIETIES TO PLANT

on the North Coast, the Marguerite has always been considered the best for the high land, whilst Pink's Prolific, a splendid late strawberry, does well on the low, rich scrublands, being quite free from the leaf fungus. A new strawberry was produced at Mooloolah in 1899, by Mr. C. Court, who named it the "Aurie." It was grown from seed imported from America, from Mr.

Root, the most celebrated strawberry grower in America. The fruit is beautiful in shape, one variety being large and broad, the other of most symmetrical, conical form. The flavour is in marked contrast to that of the Marguerite, more approaching that of strawberries grown in Europe and the States. It fruits earlier than any other known variety, has a firm flesh, a rich colour throughout, and enjoys freedom from disease. It comes in two months earlier than Marguerite or Hautbois. The fruit brought 7s. 6d. per quart in Sydney; 1,800 quarts were gathered, between May and the end of July, from one half-acre, and up to the 16th of August, 2,794 quarts of dessert fruit were picked. For healthy, vigorous growth, productiveness, size, beauty, quality, and firmness for export purposes, the Auric is without a rival here. Other varieties suitable for the North Coast (Blackall Range) are few in number. Captain and Arthur are good varieties, but the Queensland sun is too much for the latter, which dies out.

For the South-East Coast the following will be found suitable, particularly in the neighbourhood of Wellington Point, Redland Bay, and Cleveland.

Marguerite.—Fruit large, conical, flesh white; a very showy fruit and a heavy cropper, but of poor flavour. Plant subject to leaf disease (*Sphærella fragariæ*).

Trollope's Victoria.—Fruit large, roundish-ovate, skin light crimson, a great bearer, lasting longer in fruit than other strawberries in the district, and will give greater returns than any other variety. Nearly free from disease.

Federator.—A strong growing variety, does best in a clay soil; fruit round and large, sometimes cockscomb shape and very large, flesh white, and, when quite ripe, of good flavour. Travels well.

Pink's Prolific.—Belongs to the old Elton pine family. When well grown, the fruit is large, deep scarlet right through, and of fine flavour. Should be planted annually, and does better in a sandy soil than most strawberries.

Royal Sovereign.—A very fine, bright scarlet berry of good flavour; very subject to disease.

RAISING PLANTS FROM SEED.

Frequently new and valuable varieties may be obtained by raising plants from seed. Of course, the best and most likely method of attaining this result is to cross-fertilise the flowers by hand. How to do this is best explained by Mr. James Pink, of Wellington Point. He says:—

Having decided on the varieties to be crossed, and which is to be the male parent and which the female or mother parent, the two kinds should be planted near each other, so that the pollen can be quickly conveyed from one flower to the other. The plants should be strong and healthy—never breed from diseased plants. A little management will be required to bring the two parent plants into flower at the same time. The seed-bearing parent should only be allowed to carry three or four fruit; each flower of these should be fertilised with pollen taken from the flower of the male parent. The operator will require a pocket lens and a pair of wire-pincers. As soon as the flowers on the future seed-bearing parent open, and before self-fertilisation can take place, he will remove the stamens by means of the pincers. With the lens he will observe the maturity of the pollen and the condition of the stigma; then as soon as the pollen on the stamens of the male parent is in a fit state he will—with the pincers—remove those stamens and apply their dust-like pollen to the stigma of the flowers of the seed-bearing parent, and the operation is complete. The seed-bearing plant should be covered with a piece of mosquito-net before any flowers open, and remain covered till the fruit is set. This will prevent flies or bees operating on the flowers. The seed-bearing plant should be watched and attended to as its requirements may need to keep it strong and healthy, and to protect the fruit from slugs and birds. Allow the fruit to ripen well before removing it from the plant; then let it remain in a warm, open place for a day or two, when the seeds should be sown in soil composed of one part loam, one part sand, and one part very rotten leaf mould or stable manure

passed through a sieve. Well drain some pots or seed-pans and fill them with the soil, press it down firm with the hand, and it is then ready for the seed. The seed is more or less embedded on the outside of the fruit. When about to sow the seed, take the fruit in the left hand, and with a knife pare off the skin containing the seeds and drop it into a cup of water. Break up the skin in this, well separating the seeds. Then pass the water containing the seeds on to the soil prepared for them, and see that the seeds are evenly spread over the surface. Stand the pots in a shady place, and the seeds will begin to grow in a few days. They should be treated the same as any other seedlings, and will be ready for planting out in their permanent place in March. They will fruit the first season.

In field culture move the ground between the rows with a horse hoe, care being taken not to throw the soil over the plants. For hoeing the ground between the plants, a Dutch hoe is best. The weeds should never be allowed to get a start. After the plants are established they should be mulched sufficiently to keep the fruit clean, and this is best done by laying some grass round the plants and about 1 foot wide, leaving 2 feet clear between the rows to be cultivated with the horse hoe all through the season, so that the air may permeate the soil freely, carrying with it the elements of water and allowing every shower of rain to soak into the earth. By keeping the surface soil moved, it acts as a mulch by preventing evaporation.

PICKING AND PACKING.

As soon as the berries begin to change colour (which will be about the end of July and beginning of August, according to situation), they should be picked, as they ripen very fast as the sun's heat increases. (The Aurie, as stated, ripens two months earlier.) They are usually picked into plates or small flat trays, then carried to the packing-shed, where they are packed into shallow trays or boxes of pine (generally split in the vicinity). It is best to grade the berries according to size and quality, making three grades, viz.—A1, first and second quality. For carrying safely, the berries should be packed only one tier deep, and the trays should not hold more than four or five quarts each. Women make much better packers than men; their fingers being much lighter, they are not so liable to damage the fruit. After the first three or four weeks, if the berries are plentiful, it is well to leave off making the second quality grade, as the price obtained for this grade will scarcely pay for the extra work in packing them. They can, therefore, be put into the jam cask with the small berries, all the nibs being first taken off.

At present there is a steady sale at the Brisbane jam factories for all the jam strawberries that can be produced.

IMPORTED DATES.

Amongst the imports from America on the manifest of the s.s. "Upada," which arrived at Brisbane on the 26th February, were 500 boxes of dates. Seeing that this fruit grows to perfection in Queensland, and that the palms bear heavily, in Central Queensland at least in seven years, it seems extraordinary that after fifty years of experimenting with all kinds of fruit trees, dates have still to be imported. Wherever these trees have been planted in Queensland, they have not failed to produce heavy bunches of fine fruit. The date palm thrives in situations where many other fruit trees fail. In the desert country of the West, where water can be obtained by digging a hole and sinking a barrel into it, the date palm finds all the nourishment it requires. In the deserts of Africa it thrives under precisely the same conditions. In the last issue of this *Journal* we gave illustrations of date palms in full fruit at Barcardine. These trees had no particular attention bestowed on them, yet they bring forth abundant fruit. If ten date trees can be planted, why not

10,000? A plantation could be made by the children of a settler's family. A little hole in the ground, a little seed or plant and the thing is done. No after cultivation is needed. In seven years the requirements of the State could be supplied. Will the reign of corn and potatoes ever take precedence on the farm? Is there no place for the date in the citrus and plum orchards of Queensland? People have objected that they have grown date palms but they did not fruit after twenty years. The reason is that the growers have an idea that all date palms bear fruit. They never heard of the male and female palm. The palm is diœcious, having the male flowers on one plant and the female or fruiting ones on the other. One male plant will fertilise a number of female plants. It is not well to sow the seeds of imported dates, as the plants thus raised take many years to fruit. Offshoots taken from fruiting plants are best for planting, as these will fruit even in five years. Intending date growers should be careful to obtain plants of *Phoenix dactylifera*, all other kinds being useless for fruit-bearing.

A REMARKABLE PINEAPPLE.

We have received from Mr. Gerler, the well-known pineapple grower at Nudgee, a fine-looking pineapple, having the characteristics of the smooth-leaved Queen and the ordinary rough-leaved pine. The corrugations of the skin are like those of the former, and of very large size, the lower ones being as large as a half-crown piece. The stalk is also like that of the smooth-leaved variety, but the crown, which is very small, has the saw-edged leaves, as have also the narrow leaves of the foot-stalk. On being cut the fruit was found to be full of seeds. The juice was very abundant, but the flavour was wanting, the juice being very watery and too sweet. This pine is either a sport, or its flower was inoculated by insects. It grew in the midst of a clump of pines of the ordinary kind, and none of the rest showed any trace of the Queen variety. Mr. Gerler intends to plant the top with a view to ascertaining whether the future fruit will throw back to its original type, or whether it will prove to be a totally new variety.

A REMARKABLE MANGO.

Mr. G. Smallman, Bulimba, has left with us a sample of what looks very like a new variety of mango, here illustrated. The fruit is of fair size, has an exquisite flavour, and is quite devoid of fibre. The tree on which this singular horned mango is grown is between four and five years old, and is bearing very well. The late storm destroyed a good many fruits, some of which were not so markedly peculiar in shape. We believe the seed was originally obtained from a mango in Mr. Slawson's shop a few years ago. If any of our readers have noticed this formation in any of the late crop, we should be glad to hear their opinion of it. If it be a new variety, then a very excellent addition has been made to the list of good mangoes.

THE EVOLUTION OF AN ORANGE THAT WILL STAND ZERO.

In Louisiana, the orange-grower, Mr. J. L. Norman, of the Hillside Nursery, Marshville, describes how he has succeeded in producing an orange which can stand such an arctic degree of cold as zero. The fruit was sent to a New Orleans journal, and that paper says they measured an average of $6\frac{1}{2}$ inches in circumference. In colour, they were bright yellow, the skin smooth, clean, and thin. They had fewer seeds than the ordinary sweet orange, and were of unusually fine flavour. The tree was said to be very prolific. How did Mr. Norman produce this wonderful fruit? There is, in Japan, an exceedingly

Plate XXI.



A REMARKABLE MANGO.

hardy hedge orange—the *Citrus trifoliata*—which naturally will stand extremely cold weather. It has for years been used in Florida by the more progressive orange-men as stock on which to bud other and finer varieties. Many efforts have also been made to use it as the parent in producing new varieties of finer flavour and larger size that will stand the rigours and frosts of winter, and with encouraging results. None appear to have been successful until Mr. Norman took the matter in hand. He experimented for ten years in hybridisation, and finally was completely successful in producing a frost-resisting orange-tree, which he called the Nol Crossbred. Of his work and its results he writes to the *Times Democrat* :—

“It is the earliest of any of my new creations so far, out of many seedlings. By infusing the hardy *Citrus trifoliata* blood into the semi-tender Satsuma, I have obtained varieties that can stand a zero temperature. You will find this orange of good quality, with possibly a little bitter taste, which is, however, almost imperceptible. In size the fruit is intermediate between the parent varieties. It is globular shaped, thin skinned, with few seeds. The tree is thorny, and very prolific. The crossing and intercrossing of the orange, and the combinations that can be made, are very numerous, as numerous as the moves on a chessboard. I am much encouraged with the result, so far attained within the brief time of ten years that I have been engaged in this fascinating work in the vast field of unexplored horticulture; but it seems that when one embarks in these interesting experiments, he never tires of trying to fathom the unknown—always after the unattainable. It is from the second generation of seedlings that I am expecting many sports from the original type. You will notice from the foliage I send you, their varied form brought about by artificial means. It seems like a fairy tale to talk about growing shiny-leaved trees laden with golden fruit along the banks of the great lakes of the North, where the temperature drops lower than zero; but this is by no means an impossibility. Stranger things have been brought about by artificial means.”

[There is nothing improbable in this account of a frost-resisting orange tree; still we should like to hear more about it. If a tree will stand 32 degrees of frost, it would probably be no more injured by 40, or even 50 degrees. At Texas, Queensland, there are a number of very fine healthy orange-trees, which bear heavy crops. These trees have repeatedly gone through winters when the thermometer fell to 22 degrees Fahr., and in one year the mercury fell to 18 degrees, without any damage to the trees.—Ed. *Q.A.J.*]

HOW TREES DRINK.

Irrigation on the capillary attraction principle is now being investigated by the State Board of Horticulture, and the Government Experiment Station at Fort Collins, with a view to recommending it for adoption in this State. Fruitgrowers who have experimented with the scheme declare it to be entirely feasible and much more effective than the old way of feeding moisture to trees by way of the roots.

Mr. Flage Carter, of Park County, the first person to try the plan in this State, wrote to Governor Orman some time ago explaining the method of irrigating a tree by capillary attraction. He takes a vessel, a pan or a bucket, or anything that can be tied to a tree limb, and will hold water. He fills it with water, and then bends a twig about the circumference of an ordinary lead pencil into the water. The liquid will be rapidly absorbed by the twig, and in turn the water will enter the limb and soon permeate every part of the tree. The problem of keeping the vessel supplied with water is not difficult, for the reason that a half-gallon of water will do as much irrigating as many cubic inches under the present plan the adherents of the scheme claim.

"Capillary attraction is the future of orchard irrigation," says the originator of the proposition. "I took up the matter two years ago, but did not put it to a final test until this Spring. Then I had two trees that needed attention badly, and I experimented with each. One young tree had been rubbed thoroughly by a horse, and was wilted badly. I applied my method of watering it, and within one week it completely revived. I next treated a sick apple-tree, and now it is all right, thanks to the capillary attraction principle."—*The Denver Post*.

SPECKING OF CITRUS FRUIT.

By ALBERT H. BENSON.

Nearly every citrus-grower in this State who has shipped fruit to the Southern markets has had the unpleasant experience of noting the following item on his account sales: ". . . . cases lost by specks." Few growers, however, knew the cause of specking or its remedy, hence I am writing the present short article in the hope that it may be of some assistance to our growers during the coming shipping season.

Specking is responsible for a considerable loss of fruit in transit, the loss varying somewhat throughout the shipping season, being usually much larger at the beginning than at the end of the season.

The loss varies from as low as 1 or 2 per cent. to as high as 50 per cent. in exceptional cases; so that it will be seen that any means that will tend to diminish such loss will be of great assistance to the growers individually, and to the industry as a whole.

Besides the actual loss arising from specking, it is also very often a source of friction between the grower and the agent to whom the fruit is consigned; as the grower, knowing that he has shipped what was apparently sound fruit when it left the orchard, is surprised to find that a greater or smaller proportion of the fruit is absolutely worthless on reaching its destination. The grower believing that he has sent nothing but sound fruit is somewhat inclined to distrust the statement of his agent as to the loss that actually occurs, with the result that, as I have already stated, there is a certain amount of friction.

Specking, or as it is known in California, "Orange and lemon rot," is, according to Professor C. W. Woodworth, of the University of California, in a bulletin issued by him in 1902, the result of a mould fungus known as *Penicillium digitatum*, which is very similar in appearance to the ordinary bread or blue mould so well known by everyone. It, however, is quite distinct from common blue mould, which attacks many different substances, in that it only attacks citrus fruit.

The first indication of citrus fruit being attacked by this fungus is a softening and rotting of a portion of the skin of the fruit. The rotten spot soon increases in size, and is first covered with a downy white fungus, known commonly as white mould, and this gradually changes to a bluish-green colour, in which condition it is known as blue mould. The blue colour is due to the fruit of the fungus, and this fruit, when ripe, distributes countless minute spores, which are easily carried by the wind or other agencies, and thus spread the disease rapidly. The dust that flies off when a case of specky fruit is opened consists of millions of the spores of this fungus, and each of these spores, given favourable conditions for its development, will produce the disease on other fruit.

The conditions favourable to the germination of the spores are, first, moisture, and, secondly, heat. If the skin of the fruit is perfectly dry, no spores can germinate on it, but if the skin is injured the spores find ready entrance into the tissue of the punctured or bruised portion, where the natural moisture is sufficient to induce the growth of the fungus. Moisture lodging in

the eye of the fruit, such as in the navel of a navel orange, forms a good means of germination, or the skin of the fruit being kept in a moist state, owing to extreme humidity of the air, is particularly liable to infection.

Knowing as we do that this fungus is confined to citrus fruits, and that once it makes its appearance its spread is very rapid under favourable conditions, gives us the first hint as to the means to be adopted in order to keep it in check, and that is, never leave any mouldy fruit on the ground or on the tree, but always gather it and destroy it, if possible, when in the white mould stage, as it has not then reached the reproductive stage. If this is carefully followed up early in the season, the ravages of the mould fungus will be kept much in check.

The second remedy is to see that the skin of the fruit is perfectly dry prior to packing, and in order to secure this I think I cannot do better than repeat the advice I gave when dealing with the question of citrus culture in the July number of the *Queensland Agricultural Journal* for 1900.

HANDLING THE FRUIT.

Under the above heading, I will deal with the gathering, sweating, packing, and marketing of the fruit. In the first place, I wish to impress upon every citrus-grower, the extreme importance of careful handling. No fruit is more easily injured by careless handling, and none requires greater care in gathering and packing if you wish to obtain satisfactory returns from your orchard. Handle like eggs, and not like road metal—a bruised fruit is a spoilt fruit, and not only will it not keep, but it will tend to rot any sound fruit that are packed near it.

No citrus fruit should be pulled from the tree, but should be carefully cut. Pulling injures the fruit, and often prevents its keeping. Several kinds of clippers have been made for cutting the fruit, and one of the best type is now obtainable in Brisbane at a reasonable price. It cuts close, and there is no chance of injury to the fruit.

When cut, the fruit should be placed in a basket or bag, and when same is full, it should be carefully emptied into a case, taking every possible care not to bruise the fruit while doing so. The cases containing the fruit should be carried or carted to an open shed, where they should be stacked and allowed to remain without being touched for from four to six days before it is packed. This detention in the cases prior to packing is to permit of the evaporation of the surplus moisture from the skin of the fruit which, instead of being rigid and brittle as it is when gathered, becomes tough and leathery and the fruit can be handled and packed without injury. This evaporation of surplus moisture from the skin is termed sweating, and it is an essential operation in the case of all thin-skinned fruit that have either to be carted over rough roads, or that have to be exported to any southern or foreign markets. This period of detention between gathering and packing also enables all fly or moth infested, pricked or bruised fruits to be easily culled out when packing, as the injuries are then much more apparent than at the time of gathering.

In very moist and humid weather drying on trays may be necessary, and possibly artificial drying may be found advantageous.

The time occupied in "sweating" the fruit will also give an opportunity for any spores of the mould fungus that may have started growth to develop, and the fruit thus specked can be culled before packing. The stems of the balance of the fruit being dry, there is little chance of the mould fungus getting a hold. When speaking of preventive measures, Professor Woodworth recommends refrigeration, ventilation, and wrapping. The first is out of the question here for our southern trade, as the steamers are not equipped with refrigerating chambers, nor would the fruit bear the extra expense entailed by refrigeration. Refrigeration prevents the growth of the fungus, but once the temperature is raised, and

moisture is allowed to settle on the skin of the fruit, then the conditions are extremely favourable for the development of the mould fungus. Ventilation, according to the same authority, is chiefly calculated to prevent rot by carrying off the moisture that may accumulate on the fruit in the sweating process, whether in the packing-house or the case—in other words, ventilation tends to dry the skin of the fruit. If the moisture is removed promptly so as not to allow time for the germination of the mould fungus, the fruit will not decay, but will remain sound and eventually dry up.

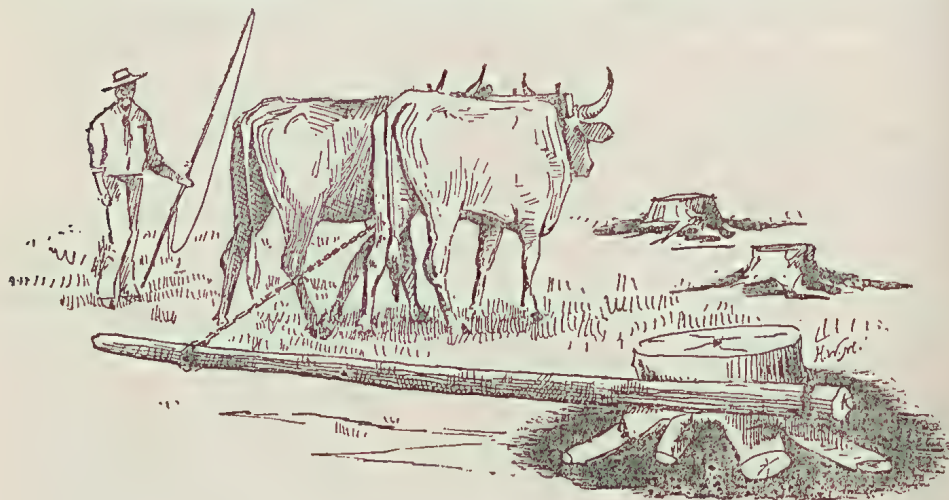
Wrapping in tissue paper is the best means of preventing specking. The paper will absorb any slight moisture that there may be on the skin of the fruit, and, further, should the fruit become one mass of blue-mould, it will keep the spores from breaking loose and thus infecting every sound orange in the case that they may come in contact with. I am of opinion that during the months that specking is bad that it will pay to wrap all the fruit that is sent south—wrapping to, of course, follow the proper drying of the skin by sweating. The cost of wrapping is not excessive, and I am certain that the diminution of loss caused thereby will pay handsomely for the extra trouble and expense.

In the earlier part of this paper I recommended the gathering and destruction of all infested fruit in the orchard, and this should also be carried out in the packing-shed or elsewhere, as no spores should be allowed to escape that can be destroyed by the expenditure of a little care and forethought.

During the present season it is the writer's intention to carry out some experiments with a view of determining the possibility or otherwise of so treating the skin of the fruit, without injury to the fruit itself, as to render it impervious to the attack of the mould fungus, and should these experiments prove a success I will at once make them known so that they can be tested on a commercial scale.

EXTRACTING STUMPS.

Amongst the many contrivances for taking out tree-stumps, we know of none better than the method employed by Mr. Thomas, of Diddlibah. The American farmers adopt a somewhat similar plan, but there is no windlass used. Two bullocks do the work. This apparatus has the great advantage of not being cumbrous. The whole thing can be packed on to a spring cart. A German method is described in *The Garden and Field*, which appears to give great power. It acts, as shown in the illustration, by levering the stump out by a twisting movement, much as a dentist removes a firmly set molar tooth—



Horticulture

TOMATOES AND APPENDICITIS.

If one were to compare the flavour, substance, appearance, and general good qualities of the vegetables sold ten years ago with what are offered in the markets to-day, the difference would be striking, even to those who know little of such matters.

Probably no more striking example of the progress made in the time mentioned can be found than is furnished by the tomato. Here is an humble product of the garden, beloved by all men who have a proper fondness for good things, that has been so changed and improved of late as to hardly know itself. And it is strange, yet true, that the improvement in the tomato has been due largely to the discovery of that popular ailment, appendicitis.

When the surgeons first established the fact that appendicitis and colic were not one and the same thing, and began to operate for the relief and cure of appendicitis, there was much discussion as to the cause of the then dread affliction. The conviction soon became general that it was due to the presence of foreign bodies in the appendix, such as fruit and vegetable seeds, and thereupon the doom of the tomato was sounded because of the many seeds contained in it. There were large and small and highly coloured tomatoes in the market, but all were full of seeds. Here, then, was a serious situation confronting the big tomato-growers, as well as gardeners generally.

There were then, and there are still, men who make a specialty of tomato-growing, and who originate all the new varieties that are offered to the growers. These did not despair, but said if the public wouldn't eat a tomato with seeds in it they'd grow a tomato without seeds. And they did. Not entirely without seeds, to be sure, but with so few seeds in them as to justify the assertion of the originators that they had produced a seedless tomato; whereupon the tomato was restored to popular favour.

But that was not the only change made in the tomato. Without the great number of seeds they were found to be far sweeter in flavour. This flavour was retained while the size and solidity were increased, until to-day there are tomatoes running up to 6 inches in diameter, from 2 to 4 lb. each in weight, that are as solid as a piece of meat, defy all sorts of weather, that last from the first picking until the coming of frost, and of which as high as 20 tons have been taken from a single acre. The tomato specialists are justly proud of their accomplishment.

But improvement in other directions has been just as great and often without such good reason. Many gardeners objected to the old way of growing lima beans. They did not want to go to the expense of cutting poles and sticking them in the ground for the beans to run up on, and it took the beans a long while to mature, anyway; so they turned out a bush lima bean, which grows only 2 feet high, needs no support, and on which the beans mature quickly and in great quantities. While they were at it, they originated a new lot of string beans which were ready for the market all of 2 weeks earlier than the usual kinds, which were really stringless and so tender they snapped when not picked carefully. That was another big stride.—*Chicago Packer.*

MARKET GARDENING.

As nearly all vegetables can now be sown, and many are being and already have been transplanted, especially cabbages, cauliflowers, lettuce, beets, &c., we think it well to answer the numerous inquiries we are now receiving as to when, where, what, and how to plant and treat vegetables during the winter and autumn, by a general disquisition of market gardening in this State.

THE CABBAGE.

We will assume that the winter cabbages—*i.e.*, Drumhead, Flat Dutch, or Queensland Headen—have been selected for sowing in January or February.

The chief requirements of the crop are rich soil, plenty of water, and thorough cultivation. Poor soil will not grow cabbages, so, if not naturally rich, it must be made so by working a liberal amount of stable and cowyard manure into the ground. The soil ought to be ploughed deeply, and thoroughly stirred up, so that the roots can penetrate in search of food and moisture. The first operation is to prepare a seed bed in the manner already described; sow the seed in little drills half-an-inch deep and 6 inches apart, and cover lightly with rotten manure or very fine soil. Do not sow deeply; if the seed is merely sown on the surface, and lightly raked in, it will grow. I advise making drills about half-an-inch thick, because it is hardly possible to make them *less* than that depth.

Give plenty of water in dry weather after the plants begin to grow; and do not leave the covering too long on the beds, or your plants may get weak and spindly. The young plants should be ready to go out 4 or 5 weeks after sowing; and ought to be set out at the first favourable opportunity, on a dull or showery day. It is a good plan to sow a little seed every month, so as to always have some plants ready to go out whenever the weather is suitable.

If the ground is very dry at planting time, take a hose or watering-can and pour a little water in each place where a plant is to be set. This will prevent the soil from crumbling into the hole, which it will otherwise do in dry weather when the dibble is withdrawn.

Before taking the plants up, the bed should be well soaked, and, if any grubs or aphids are present, the plants, on being lifted, should be dipped in tar water or tobacco water, holding them so as to immerse every part except the roots. It is beneficial in dry weather to trim the leaves by cutting them half off with a knife. These leaves would decay and drop off in any case, and by cutting them back there is less foliage left to use up the scanty moisture in the ground. The roots should be placed in an inch or two of a puddle made of soil and water in the bottom of a bucket, and the plants carried to the field thus, and the roots should not be exposed to the sun or wind. A wooden dibble made from the handle of an old spade or fork is the handiest implement to use for planting.

When you make the hole, only make it deep enough for the plant, and put the roots to the bottom, pressing the soil firmly around it. Should dry weather continue, watering will be necessary several times a week until the young plants become firmly established; and no matter what the weather may be it will be found of very great benefit to mulch them.

To plant on a large scale, mark out the rows with a corn-marker, and set four or five men to work planting as follows:—

One goes along first and makes the holes with a light crowbar or pointed hardwood pole; the next follows with the plants, putting one down at each hole; a third firms the soil around the plants, and leaves them planted properly; while the fourth man keeps up a supply of young plants from the seed bed. If you have one careful man to do the actual planting, the rest of the work can be done perfectly well by boys, and in this way a large area of ground can be got over in a day.

Always plant in straight rows, and have the large growing kinds 3 feet apart each way, and the smaller ones about 2 feet. It is sometimes an advantage to open a shallow furrow with the plough in each row, and set the plants in the bottom of the furrow. They are protected thus in some measure from the sun, and will not require hilling up, as the gradual filling up of the furrow during subsequent cultivation will do all that hilling up performs, and do it better.

Now the great secret of success in cultivating plants of the cabbage family is to *keep them constantly growing*, and never allow them to be checked by any cause whatever.

Push them along quickly by constant cultivation and plenty of water. A watering with liquid manure once or twice a week will help greatly to promote rapid growth. It is when plants are checked, or growing slowly from any cause, that they become most susceptible to the ravages of insect pests, plants which are growing rapidly and vigorously being seldom much injured by pests.

Further, if plants of the kind we are now speaking of take too long to mature, the heads instead of being tender and succulent become tough and leathery. Cabbage ought to be ready for table in three or four months at most after planting. Keep the ground clean, and conserve the moisture by constant cultivation. Do not cultivate only when you see weeds, but after every shower of rain until the plants get too large to allow of the implements being used among them. In the cooler parts of the colony, cabbages can be grown all the year round, but in the warmer districts it is hardly worth while growing them in the summer months, as there are so many insect and other pests to contend with that a great deal of the profit is lost in keeping the plants clean. In the warmer districts the first sowing may be made in January or February, and then at intervals of a month or so up to August or September. For summer crops, St. John's Day and Early Jersey Wakefield are about the best, as they are early sorts, and mature very quickly; in winter the Drumhead type, of which Flat Dutch and Queensland or Florida Headen are good examples, are the most profitable.

THE CAULIFLOWER.

The same conditions as are necessary for cabbage-growing are required for cauliflowers, and the importance of having rich soil is even greater.

As a rule, rich new land which has not been previously cropped will produce the best cauliflowers. The seed is sown in the same way as cabbage seed, and the planting is done in the same way also, but more care is required in planting than is necessary with cabbage.

Cauliflower seed may be sown in January or February, and again in March or April. If any is sown after April, it must be a very early variety, which will mature before the weather gets too hot. After planting, it is absolutely necessary that the plants be kept constantly growing, as a check of any kind, whether caused by want of water, poverty of soil, or from whatever reason occurring, means serious injury to the crop, and a consequent diminution of profits. Cultivation should be thorough and pretty deep until the plants begin to head, or until the leaves spread so much that they are liable to be broken by the cultivating implements. As soon as any signs of heads forming are noticed, cultivation may cease, because, if still carried on, there is a tendency for the heads to grow loose and coarse instead of firm and compact. At this stage, however, water is more essential than ever, and a good watering with liquid manure twice a week will add greatly both to the bulk and quality of the crop.

Now, it must be remembered that the market value of cauliflowers depends entirely on their being of fair size, and *white* and *tender*. If not well looked after now, the heads will become yellow in colour, with a disagreeable flavour, and more or less tough.

To prevent this, as soon as the heads begin to form, the leaves ought to be drawn together at the top, and tied or skewered over the heads. This will protect them from the sun, and cause them to be properly blanched.

The plants should now be inspected every day; all those that require tying up, attended to; and all that are fit to cut, harvested.

It is best to cut early in the morning, cauliflowers harvested while the dew is on the plants keeping fresh for a longer period than if left until the sun gets hot.

The following indications will show when a head is ready to cut:—

The leaves bulge out considerably at the base, and the head begins to lose the polished, smooth appearance which has hitherto characterised it, and becomes grained and somewhat irregular. To examine the heads, it is not necessary to untie the top leaves, but part them at the side, so that, if not quite ready, cutting may be deferred until the next day. Cut with 2 or 3 inches of stalk and two or three circles of the leaves.

Handle very carefully, and take care not to bruise the heads in any way, as even a slight bruise soon becomes black, and detracts greatly from the market value.

Small crates should be used for cauliflowers, the large crates used for cabbages holding so many cauliflowers that their weight causes them to bruise and injure each other.

INSECT PESTS.

Both cabbage and cauliflower are subject to the attacks of insect pests. Young seedling plants are often attacked by a small grub which eats the heart right out. When the plants are more mature they are attacked by a species of moth, the larvæ of which riddle the leaves and render them very unsightly.

Spraying with Paris green in the seed bed, or dipping the young plants in tobacco water or tar water before planting, will usually be sufficient for the first-named pest. Paris green sprayed on the plants immediately the larvæ are discovered on the leaves will destroy most of the second.

Aphides frequently are a source of trouble, and if not promptly dealt with they increase with amazing rapidity. Weak kerosene emulsion or tobacco water will destroy aphides easily, but as in the case of all other pests it ought to be tackled as soon as it makes its appearance. Sometimes only one or two plants in a field are found infested with aphides, and in this case they should be pulled up at once and destroyed, as by so doing the pest may be prevented from spreading. It must be borne in mind that Paris green, being an arsenical poison, must not be used on crops of this kind within five or six weeks of their being ready for market. Where practicable, it is advisable to alter the location of the cabbage and cauliflower crops every season, as by so doing the danger from insect pests is considerably lessened.

With good soil, a plentiful water supply, and intelligent care, first-class cauliflowers can be grown in many parts of Queensland; and there is money in the business, as immense quantities of this vegetable are annually imported from the southern colonies. If they can be grown at a profit there, and shipped up here, it should be possible for us to grow them at a profit here, as, of course, being nearer to the market, we are enabled to place them for sale in better condition than those coming from Melbourne or Sydney, which, in addition to being some days in transit, are also considerably knocked about in handling. Some of the farmers in the Logan district have already awakened to the possibilities of cauliflower-growing; they grow first-class crops, and find no difficulty in disposing of them at good prices.

Excellent cabbages and cauliflowers are grown at Warwick and Stanthorpe, and also along the Central line west of Rockhampton, as well as in all the districts of the Southern coast. These all meet with ready sale either locally or in the centres of population on the coast.

PEAS.

Peas may be grown in many different kinds of soil, but a rich, light, sandy loam is perhaps the best. If manure is used, it should be well decomposed, and thoroughly worked into the ground.

The time for sowing here is from January to September, sowing enough once a fortnight or so to keep up a constant succession. The dwarf varieties

should be sown in rows not less than 3 feet apart, and the tall-growing kinds about 5 feet; a good plan is to plant the rows of tall peas 8 or 9 feet apart, and grow two or three rows of cabbages or other vegetables between. By this plan the sunshine and air have free access to all the rows of peas, which would not be the case if they were so close as to partly overshadow each other.

A common mistake in sowing peas is planting them too thickly. The seeds should be dropped into the drills from 3 to 4 inches apart, and the drills should be from 2 to 3 inches deep. In moist weather $1\frac{1}{2}$ or 2 inches is deep enough; but in very dry weather it is advisable to sow a little deeper in order to get the benefit of the moisture in the soil. Peas are very often sown in double rows, 6 inches apart, and the seeds at intervals of 6 inches in the rows. By this system a good crop can be obtained, and also ground economised where the latter is valuable or of limited area.

The tall varieties require some kind of support, such as brushwood or sticks, or, better still, wire-netting, which can be placed over the rows, supported on stakes, the lower side of the netting being about 10 inches above the ground.

In dry weather, frequent cultivation is necessary, and an occasional watering will also be beneficial; if liquid manure is procurable, so much the better for the crop.

Very fine peas are sometimes grown by sowing them in a furrow 6 inches deep, only partially filling in the furrow at first, and gradually filling it up as the plants grow.

Good varieties to grow here are McLean's Little Gem, Stratagem, Yorkshire Hero, American Wonder, Pride of the Market, and Sir Henry Atkinson.

None of these are very tall-growing kinds, and they can be grown without staking or trellising; but it may as well be borne in mind that even the dwarf varieties (with the exception of the very small ones) will yield better crops, and be much easier to pick, if trellised, than if left on the ground unsupported.

BEANS.

Beans for gardening purposes comprise French or kidney beans, pole beans of various kinds, broad beans, and Lima beans.

All these are annuals, except the Limas, which are perennials where the winter is not too cold, although in the Southern part of the colony they may for all practical purposes be considered as annuals. French or kidney beans (*Phaseolus vulgaris*) can be grown nearly all the year round in many parts of Queensland, but where winter frosts prevail the season may be reckoned from the middle or end of August until April or May. During these months, successive sowings may be made at intervals of two or three weeks when the ground is not too dry. Any good garden soil will grow French beans, but the best crops are obtained from good loams or alluvial soils.

The drills should be a few inches deep, the depth varying from 2 to 4 inches, according to the weather and the state of the soil.

The rows should be about 3 feet apart, and the seeds at least 6 inches apart in the rows.

If the soil is very dry, the drill should be watered well before sowing.

The beans should be gathered as they become fit—that is, while young and tender; and unless it is desired to save some for seed, they should not be allowed to ripen, as thereby the bearing power of the plants will be considerably lessened.

Pole or runner beans are summer plants, and may be sown from September to February or March. The rows for these should be 4 or 5 feet apart, and before planting poles about 6 feet long should be set up along the rows at a distance of 3 or 4 feet apart. Around each pole plant 6 or 8 seeds 2 inches

deep, and when they come up thin them out, leaving 4 of the strongest plants to each pole. It may sometimes be necessary to tie the young tendrils to the poles at first, but as soon as they begin to run they will twine around the sticks naturally without any artificial help.

Broad beans do not succeed well in the hot weather, their season being from March to August or September. Sow in drills 3 or 4 feet apart, 3 inches or so deep, and the beans about 9 inches apart in the rows.

When the plants come into flower, their tops should be pinched off in order to check the upward growth of the plants and cause the beans to set. If this pinching is neglected, in all probability the plants will continue to grow, most of the flowers will drop off, and there will be little or no crop. The beans should be gathered as they become fit, whether they are wanted or not, so as to prolong the bearing season as much as possible.

Lima beans are a good crop to grow in the summer months, as they will stand any amount of heat and dry weather, and continue in bearing for a very long time. The Dwarf or Bush Limas are perhaps the best to grow, as they require no poles, and consequently give less trouble. Lima beans, both dwarf and pole varieties, may be planted in August or September, and again in November, and will continue to grow and bear until cut down by the frosts in winter. Dwarf Limas may be planted in drills 3 feet apart, and the seeds 18 inches apart in the rows or in hills of four or five seeds 3 feet apart each way. The seeds should not be planted more than 2 inches deep, and should be placed in the ground edgewise with the eyes down.

The pole Limas require precisely the same treatment as other pole beans. It is hardly necessary to state that the French beans and most of the pole beans are *pod* beans, of which the edible part is the young tender seed-pod. Broad and Lima beans, on the other hand, are *shell* beans—the part used for food being the bean itself, and not the pod.

All of these, except the Limas, must be used when young and tender. The Lima beans may either be used green or allowed to ripen and stored for use in winter. They will keep for a long time, and only require soaking in water before cooking, to render them soft and palatable. Lima beans should be more extensively cultivated than they are, because they will succeed in dry seasons when other beans fail, and continue to bear right through the summer.

The varieties of French beans (including so-called butter beans) are legion, and each grower must choose the kind best suited to his requirements.

Of the Limas, Burpee's Bush Lima is a very good kind. The beans of this variety are considerably larger than most of the other Limas, and are also very tender and palatable.

CARROTS may be sown from February till August. Sow in drills, 9 inches between the rows. Thin out when young to about 6 inches apart. In soil of a stiff, heavy nature, sow the Short Horn variety; in lighter soils, Early Long Horn, Long Red, White Belgian, and Scarlet Intermediate. Carrots should be ready for use in from eighty to 100 days after sowing.

CELERY—This useful vegetable may be sown from February to June. A rich, moist soil is best for it; but we grew good celery all last summer on a gravelly soil, well-manured with stable manure and regularly irrigated. When the plants are about 4 inches high, prick them out in beds at distances of 6 inches. When they have made good, strong plants, get ready trenches 1 foot wide and 1 foot deep. Put 3 inches of well-rotted manure at the bottom. Incorporate it well with the soil. Then transplant your celery—6 inches apart is sufficient distance. Give them a good soaking. As they grow, gradually draw the soil round them, holding the plant with one hand and filling-in with the other. No soil or manure must be allowed to get into the heart, or the celery will be rusty, instead of being beautifully blanched. Keep on doing this at intervals as the plants grow, leaving 6 inches of the leaves exposed. The hardiest variety is the Mammoth Red; Crystal White is also a good kind, crisp and delicate.

LETTUCE.—Sow the seed in a box. When large enough, plant out. You may plant them between the cabbage-rows, as they will be ready to cut long before they can interfere with the latter. The Cabbage lettuce is the most satisfactory to grow. The Cos requires tying up to bleach the inner leaves.

PARSNIPS.—The culture of parsnips is exactly the same as for carrots. Sow the seed in April, in drills 9 inches apart, and thin the plants out to 8 inches apart. They will be ready for use in 100 days after sowing.

TURNIPS.

The smaller kinds of turnips, which are usually either white or reddish in colour, are those chiefly grown in gardens, the large Swede turnips being strictly speaking a field crop, although they are by no means to be despised in the garden. There are many different varieties of garden turnips, but most of them are pretty much alike in flavour and size.

Turnips succeed best in cool, moist situations, but may be grown during the winter in many parts of Queensland; some varieties even may be had all the year round, except in the very hottest part of the summer.

Well-worked, moderately rich soil will grow good turnips.

The drills may be from 16 inches to 2 feet or more apart, and about 1 inch or $1\frac{1}{2}$ inches deep.

Thin out the plants to 4 or 6 inches, and cultivate well whilst growing.

Turnips are sometimes attacked by aphides, which, if not checked, spread with alarming rapidity, and will soon exterminate a whole field. Spraying with kerosene emulsion or tobacco water, on first noticing the pest, will usually effectually get rid of it.

The same grub or larva, which is so destructive to young cabbage plants, frequently attacks turnips in the warm weather; and sometimes a whole crop will be cleared off in a few days by this pest. The best remedy is spraying with Paris green; care being taken, however, that the turnips are not used for some time after spraying.

White Dutch, Red American Stone are good sorts.

BEEF ROOT.

The best beets are grown in fairly dry, rich, sandy loam soils; but good beet may be grown in almost any kind of soil, provided it is well broken up, and not of too stiff and clayey a nature.

As in the case of the carrot and parsnip, fresh new manure should never be used for beet root. If manuring is necessary, it should be done some time before the seed is sown, and well mixed with the soil. The seed may be sown for the winter crop in February or March, and for the summer crop in August or September; or by sowing a little every six weeks or so, a constant supply can be kept up all the year round.

Sow in the same way as turnips, and thin out to 8 or 9 inches. When thinning the plants, any blank spaces which may occur in the rows can be filled up, as beet stands transplanting well. There are two kinds of beet grown as garden crops—namely, the Red Beets (which may be either turnip-rooted or long-rooted) and the silver Beets.

Of the former, only the roots are used, chiefly in the form of salads, and of the latter the leaves cooked as spinach form a very palatable dish, especially when other vegetables are scarce. They are very hardy, and will live through weather that would kill almost any other kind of vegetable. For sowing the seeds of all these crops, no better implement can be used than a Planet Junior seed drill, which does the work of three men in less time than it could be accomplished by any other means.

ONIONS.

We have so frequently treated the culture of the onion in this *Journal* that there is no occasion to give further instructions at present.

SALADS.

Salads of several kinds should find a place in every vegetable garden.

Lettuce has already been mentioned.

Endive is a species of chicory, which may be grown all the year round, in the same way as lettuce, but the leaves must be tied together to blanch them. They are rather bitter to the taste. Sow in open ground, or plant out from a seed bed to 5 or 6 inches apart. They will be ready for use in fifty days.

Radishes are annuals. They may be grown all the year round in Queensland, but under some shade in very hot weather. Sow in shallow drills 6 inches apart. Light, sandy soil suits them best. Sow every three weeks. There are two types of the radish, long and turnip-rooted.

Mustard and Cress.—These may be sown together, but it is preferable to sow the mustard a week later than the cress owing to its quicker and stronger growth. Sow pretty thickly. Cut for use when about 3 inches high.

Rhubarb.—Instead of sowing the seed, procure "crowns"—that is, plants—from a seedsman, plants from one to two years old. Plant in July or August. In September the stalks will be ready for use. Rhubarb requires a deep, well-drained soil. Set the plants in rows 4 feet apart, with a distance of 3 feet between the plants. Varieties which succeed well in this State are—Joppa, New Winter, Myatt's Victoria, and Giant.

Kohl-rabi.—This is a kind of turnip-rooted cabbage. The stalk swells out to the size of a large turnip, and from it the leaves spring on all sides. This enlarged stem is excellent when boiled. The leaves are also good as a vegetable. The plant should be cut when young and tender.

Egg-plant.—The egg-plant is as easily cultivated as the tomato, to which it is allied, being a *Solanum*. The seed should be sown in a warm place in September, and the plants may be planted out 2 feet apart. The purple variety—in India called the Brinjall—is the kind usually grown for table use. They should be gathered before they are ripe. Cut in slices and fried they make an excellent vegetable.

Leeks.—Leeks love a rich, deep soil. Sow the seed in April and May, and transplant when they are 8 inches high. When planting out, shorten the roots to about 1 inch, and cut 2 or 3 inches off the leaves. Plant out in drills, 15 inches apart and 6 inches deep. Plant them at the bottom of the drill, nearly up to the leaves, at a distance of 8 inches apart. Cut back the leaves once a month during growth to make the necks swell out. Fill up the drills as the plants grow.

Spinach.—Spinach, especially the prickly variety, grows well in the Southern portion of the State. The round kind is good for a summer crop; the prickly for winter. Sow in April and May, in drills 2 feet apart and 2 inches deep. Thin out the young plants to 12 inches apart, using the thinnings for culinary purposes. After the plants are well developed, all the outside leaves should be gathered as required for use until the flower stalks appear.

Tomato.—The soil for tomatoes should be thoroughly cultivated to the depth of at least a foot, and reduced to a fine tilth. It is a good plan to mix coal cinders with the soil. Sow the seeds either in boxes or in a well prepared seed-bed, and sift some fine soil over them to a depth of $\frac{1}{4}$ inch. Give a light watering, and transfer the boxes to some dark, warm place till the seeds germinate. After that they may be transferred to the open. When four or six leaves have formed they may be pricked out into a bed at a distance of 6 inches apart. When they are about 8 inches high transplant them into thin permanent beds 3 feet apart every way. Support them on sticks or on a trellis. As the plants grow, two or three lateral shoots will appear. As soon as these

are large enough take them off. No other growth can then ensue. Train the plant like a fruit tree to a single stem. Then, at intervals, on all the main branches, vigorous bunches of flowers will appear, and by and by, if the plants have been well looked after, abundance of fruit will be the result. It is not generally known that tomatoes will grow freely from cuttings. Make the cuttings rather long. Lay them horizontally in the ground at a depth of 2 or 3 inches, leaving the head above ground. Water judiciously, and roots will spring from every joint. This plan gives the plant a good hold on the ground. The best varieties are Ignotum, Ponderosa, Large Red, and Mikado.

Herbs may be sown from March to September. In every cottage garden there should be found thyme, sage, marjoram, mint, parsley, rosemary, and fennel.

MANURES FOR VEGETABLES.

With the exception of peas and beans, vegetables do not very much exhaust the soil. The principal constituent they take up is potash, nitrogen comes next, and phosphoric acid last. Thus, 1,000 lb. of cabbages will withdraw 4.3 lb. of potash, 3.8 lb. of nitrogen, and 1.1 lb. of phosphoric acid. The potash gives solidity and crispness to the stems and leaves and a high colour to the fruit. Nitrogen forces the early growth, and gives large, succulent leaves and stems; and phosphoric acid gives plumpness, and increases the sugar and starchy parts of seed and forces early maturity. In our rich scrub and black soils, which contain all the elements of fertility in available form for many years after being first cropped, manures are not needed or are needed only to a limited extent, but on poorer soils, and where intensive market gardening is carried on, a good general fertiliser consists of about 200 lb. sulphate of potash, 300 lb. of superphosphate, and 200 lb. of nitrate of soda per acre. This fertiliser, well mixed, should be raked in just before the seed is sown. Sulphate is the best form of potash for garden vegetables, as it contains no chlorides of salt, and does not make the soil cold. Fresh or water-slaked lime is always beneficial to garden soil. For peas and beans, double the quantities of potash and phosphoric acid may be used, but the nitrate of soda may be reduced to 50 lb. an acre. For root vegetables, phosphoric acid and potash are as important as nitrogen. For vegetables the seed of which is the edible portion, phosphoric acid is the most important; and for such vegetables as tomatoes, egg-plant, celery, melon, &c., potash is most needed.

HOUSEHOLD RECIPES.

BOILING RICE.

How very few people, who are not professional or expert cooks, know how to properly cook rice, especially rice to be used with curry. Either they make a mash of soft grains, or else the rice is insufficiently cooked and comes to table hard and unpalatable. Here is a West Indian cook's recipe for preparing rice for curry:—

Wash him well; must wash in cold water, or rice flour make him stick. Make water boil fast all ready. Throw him in then, rice can't burn, water make him jump too much. Boil quarter of an hour or little more; rub one rice in finger and thumb; s'pose all rub away, him done. Put rice in colander, hot water all run away; pour cup of cold water on him, put rice back in saucepan, keep him covered near fire; then rice all ready. Eat him up.

BOILED RADISHES.

Boiled radishes never form a part of the *menu* of our dinner table, yet they are better than turnips. Boil turnip radishes in plenty of salted water for 25 minutes. They will then be quite tender. Serve with melted butter. Young long radishes tied in bunches, boiled for 20 minutes and served on toast, are excellent.

Tropical Industries.

TOBACCO NOTES.

By R. S. NEVILL.

The French Government realised from its tobacco monopoly in October last £2,000,000.

The tobacco monopolies of the United States have now such complete control of the market that growers throughout the country are organising in order to maintain a fair value for tobacco.

A great many buyers have been compelled to quit the market, as these monopolies will not take their purchases, but buy direct themselves, and thus competition is fast approaching the vanishing point.

The Continental Tobacco Company, one of the United States monopolies, claims a value of £14,500,000 for its brands and goodwill alone.

Last year there was 1,030,734 acres in tobacco in the United States, producing 821,823,963 lb., Kentucky leading with 322,194 acres, producing 257,755,200 lb.; North Carolina and Virginia being the next largest in the order named.

In 1902, in the United States, $3\frac{3}{4}$ lb. of tobacco, 3 oz. of snuff, 72 cigars, and 72 cigarettes were consumed for every inhabitant of the country, yet there are countries that exceed this.

PROFITS FROM A RUBBER PLANTATION.

The *India Rubber World* is often in receipt of inquiries regarding actual results attained in rubber culture, as a basis for estimating possible profits. The answer that must be made in all cases is that none of the extensive plantations thus far formed on a commercial scale are yet old enough to have become productive, but that the planters have been induced to embark in the business by what has been observed of the rate of growth and production of a few trees at a place, in many localities, and under varying conditions. Mention has been made more than once in the *India Rubber World* of a rubber plantation in the State of Chiapas, Mexico, from which shipments of rubber have actually been made. About thirteen years ago a Mexican planter set out a number of rubber-trees (*Castilloa elastica*) as a shade for cacao, which grew so rapidly that in time the cacao was practically starved out; and of those trees some 5,000 are now standing, in a vigorous condition. A few years ago Mr. O. H. Harrison, engaged in coffee-planting in Chiapas, bought this property, including adjacent lands containing wild rubber-trees, for 12,000 dollars Mexican. Within eight months he had sold in London enough rubber from the wild and cultivated trees to pay the purchase-price for the property. This formed the basis for La Zacualpa Rubber Plantation. A like amount of rubber has been sold from the property each year since, and more land has been purchased, the cost of the whole having been met by the proceeds of the rubber sold. During this time there has been no outlay for labour in caring for the cultivated trees, beyond the collection of rubber. The land having been paid for, the proceeds of rubber sales will be devoted to dividends on La Zacualpa shares. Mr. Harrison reports that these trees yield an average of at least 2 lb. of rubber a year—tapped once—and is convinced that a good profit could be made with a yield of half as much, which would give from 200 to 300 lb. of rubber per acre, according to the number of trees. The new planting on La Zacualpa Plantation has been done with seeds from the productive trees referred to, so that no doubt can exist as to the variety that is being planted.

COCOANUTS AND COPRA.

In answer to a correspondent of the *Tropical Agriculturist*, Ceylon, the editor of that journal says it requires from 170 to 200 nuts to make 1 cwt. of copra—say, 3,700 nuts to the ton; and, generally speaking, six cartloads of cocoanuts, if converted into copra, would make only one cartload. A good deal of labour and special care are needed in preparing copra properly. Numbers of cocoanut-trees have been planted on the islands off the north coast of Queensland by the Department of Agriculture, but nothing has as yet been done in this State in the way of making copra. The tree fruits in its fifth year, and will produce from nine to twelve clusters of flowers each year afterwards. Each cluster will give from twelve to twenty nuts. Fruitfulness increases up to fifty or sixty years of age; after that it falls off, although, under favourable conditions, the tree will attain a maximum age of 100 years. Exceptional trees sometimes produce forty nuts on each bunch.

The husk is very valuable, both as fibre for bedding and as a medium for growing cuttings, plants, and bulbs, which root in it with great facility. It harbours no vermin, nor is it subject to fungus.

SUGAR EXTRACTION—GRINDING V. DIFFUSION.

A COMPARISON OF THE ADVANTAGES AND DEFECTS OF THE TWO PROCESSES OF SUGAR EXTRACTION, AS APPLIED TO SUGAR-CANE.

By H. G. PRINSEN GEERLIGS.

The following extract from Professor Geerligs' manual on sugar-extraction appears in the *Journal d'Agriculture Tropicale*, which journal has persistently opposed the diffusion process, and what follows furnishes good reasons for such opposition:—

The argument for and against diffusion and extraction by crushing resolves itself more and more in favour of the latter process. A result which is due principally to the numerous improvements of late years in sugar-mills and in apparatus for sugar-making. . . . The construction of mills has reached great perfection, breakages occurring far less frequently than formerly, and when an accident happens the damage is quickly repaired. Then, the introduction of cutters and shredders has greatly contributed to ensure a greater regularity in the working of the whole factory.

One great advantage the mills have over the diffusion batteries is, that their capacity leaves a greater margin for changes in the product. In a case of urgency—for instance, after a fire—when the cane must be crushed at once, 600 tons a day can be crushed by a mill which normally is adapted to crush only 450 tons. Provided that the rest of the machinery is able to treat all the juice produced, things will come out all right. It is clear that such a press of work will influence the quality, and that a less complete extraction will take place, but there are cases in which such things are readily accepted.

It is true one may conceive of a diffusion plant being equally capable of dealing with an extra pressure of work of this nature; but, even admitting a very weak extraction, all the cane could not be dealt with, because at the outset one would be confronted with the inability of the chaffing-machine to turn out a sufficient quantity for diffusion. The advantages of the diffusion process are: The almost perfect extraction of the sugar in the form of pure juice, and the retaining of the greater part of the impurities in the mégasse, thus rendering the juice easy to treat.

There is also less danger of a stoppage owing to some accident, for if one diffuser is damaged it is thrown out of the series and the work goes on with the remainder—a thing which is not possible in a mill.

The principal disadvantages are, besides those already mentioned: The great number of hands needed in the diffusion process requires the supervision of men well up to the business. Furthermore, the diffusion juice is very much diluted; consequently great expense is incurred in the fuel requisite to evaporate the water. It is true that in some factories working with rollers the dilution by maceration is also very great, but only in the case where canes are crushed containing such a high percentage of sugar as to justify this dilution; whilst by diffusion it is impossible to diminish the dilution even with poor canes, so that, be the juice rich or poor in sugar content, both are equally diluted. Then, again, the cutting machine requires plenty of steam and much repair, because it has very hard work to perform in cutting the cane into thin slices. Finally, the latter, after extraction of the juice, are so swelled with water that to convert them into fuel they must be passed through rollers before they can be dried in the sun.

Of course the rollers performing the work are not so expensive as those used for crushing the cane, but still it is most inconvenient to be compelled to employ rollers as well as a diffusion battery. Again, the *mégasse*, which has been first cut, then crushed and dried, is left in a much finer condition (in smaller pieces) than that which has only been crushed, and as a consequence it does not make such good fuel.

To sum up, the diffusion process offers some advantages. It produces more sugar and in purer solution, and the work is more regular. But, on the other hand, it requires more labourers, and cleverer labourers; more fuel is wanted, and a less useful *mégasse* is left. Then, the capacity of the factory scarcely lends itself to an increase or decrease of the quantity of cane to be worked up, at least, not so easily as does a roller mill. We may also urge a last argument. Every time the battery stops we are confronted with this alternative: Either we must work with the whole force of the battery, and extract the greater possible amount of sugar at the cost of a heavy dilution of the juice, or stop the supply of water at a time when the cane is only half exhausted of its sugar. Generally, a middle course is adopted, and thus, at each stoppage, there is both a considerable loss of sugar and a heavy dilution, which adds greatly to the cost of fuel. Now, a cane-sugar factory, unlike a beet-sugar factory, has not at its disposal a *dépôt* of the raw material, and the arrivals at the factory may be very irregular, particularly in a rainy season. The inconvenience of this stoppage of the diffusion battery thus assumes a grave character unknown in European beet factories, whilst the frequent stoppages do not in the slightest affect the working of a sugar factory working with rollers.

THE SUGAR BOUNTIES AND THE BRUSSELS CONVENTION.

The Right Hon. A. J. Balfour, speaking in the House of Commons in February last, stated, with regard to the Brussels Sugar Convention, "that the Powers interested had been forewarned that Great Britain would never penalise sugar from British colonies. The Powers had made no protest against this, and therefore the British condition for the ratification of the Convention, which includes the imposition of countervailing duties on bounty-fed foreign sugar, stands good." And again, a little later, he "emphasised the declaration of Great Britain that she would not allow any suggestion as to the penalising of sugar from British colonies to come before the Brussels Commission, and he added that if the Powers introduced it they would be absolutely unable to coerce Great Britain in the matter."

Russia and America were not represented at the Intercolonial Sugar Convention, but there are indications that the former Power will ultimately adhere to the terms of Brussels Convention for the abolition of the sugar bounties. It stands to reason that when those bounties are removed the beet sugar countries cannot send cheap sugar to England, and consequently the

British consumer will have to pay a somewhat higher price for the commodity for a time.

The abolition does not take place until September, 1903. Most of the raw sugar imported into Great Britain is a continental production. What the continental manufacturers will then do will probably be to refine the sugar themselves, and deluge the British market with their cheap product, thus cutting the ground from under the feet of the British refiner.

It will be interesting to many of our readers engaged in sugar production, and also to those who use large quantities of sugar in various industries, to read the full text of the terms of the Convention as signed at Brussels on the 5th March, 1902, and concluded between the Governments of Germany, Austro-Hungary, Belgium, Spain, France, Great Britain, Italy, the Netherlands, and Sweden. We take the translation of the terms of the Convention from the *International Sugar Journal* :—

ARTICLE I.

The High Contracting Parties undertake to suppress, from the date of the coming into force of the present Convention, the direct and indirect bounties by which the production or export of sugar might benefit, and not to establish bounties of such a kind during the whole duration of the Convention. For the application of this provision, sugar products, such as preserves, chocolates, biscuits, condensed milk, and all other analogous products containing, in a notable proportion, sugar artificially incorporated, are assimilated to sugar.

The preceding paragraph applies to all advantages resulting directly or indirectly for the different categories of producers from the fiscal legislation of the States, including—

- (a) The direct bounties granted to exports ;
- (b) The direct bounties granted to production ;
- (c) Total or partial exemptions from taxation granted for a part of the manufactured output ;
- (d) Advantages derived from excess of yield ;
- (e) Advantages derived from the exaggeration of the drawback ;
- (f) Advantages derived from any surtax in excess of the rate fixed by Article III.

ARTICLE II.

The High Contracting Parties engage to place in bond, under the permanent supervision, both by day and by night, of the Revenue officers, sugar factories and sugar refineries, as well as factories for the extraction of sugar from molasses.

For this purpose, factories shall be so arranged as to give every guarantee against any surreptitious carrying away of sugar, and the said officers shall have power to enter all parts of the factories.

Controlling books shall be kept in connection with one or more of the processes of manufacture, and finished sugars shall be placed in special store-houses giving all proper guarantees of security.

ARTICLE III.

The High Contracting Parties undertake to limit the surtax to a maximum of 6 fr. per 100 kilog, for refined sugar and assimilable sugars, and to a maximum of 5 fr. 50 c. for other sugars. The surtax is the difference between the rate of duty or taxation to which foreign sugars are subject and that imposed on the home product.

The provisions of this Article do not apply to the rates of import duty in the case of countries that do not produce sugar, nor do they apply to the by-products of sugar manufacture and refining.

ARTICLE IV.

The High Contracting Parties agree to impose a special duty on the importation into their respective territories of sugars from countries that grant bounties either on production or export.

This duty shall not be less than the amount of the bounties, direct or indirect, granted in the country of origin. The High Contracting Parties reserve to themselves, as far as each of them is concerned, the option to prohibit the importation of bountied sugars.

In order to calculate the amount of the advantage eventually derived from the surtax specified in paragraph (f) of Article I., the figure fixed by Article III. is deducted from the amount of this surtax; the half of the difference is considered to represent the bounty, and the Permanent Commission instituted by Article VII. will have the right, on the demand of a Contracting Party, to revise the figure thus fixed.

ARTICLE V.

The High Contracting Parties mutually undertake to admit, at the lowest rate of import duty, sugars of any of the contracting countries or of any Colonies or Possessions belonging to them that do not grant bounties and to which the obligations imposed by Article VIII. apply.

Cane and beet sugars shall not be subjected to different rates of duty.

ARTICLE VI.

Spain, Italy, and Sweden are exempt from the obligations imposed by Articles I., II., III., so long as they do not export sugar.

These States engage to adapt their legislation in the matter of sugar to the provisions of the Convention within a year—or earlier if possible—from the time when the Permanent Commission notifies that the above-mentioned condition has ceased to exist.

ARTICLE VII.

The High Contracting parties agree to establish a Permanent Commission charged with watching the execution of the provisions of the present Convention.

This Commission shall be composed of Delegates of the different Contracting Powers; a permanent Bureau will be connected with it. The Commission will elect its President; it will sit at Brussels, and will assemble at the summons of the President.

The duties of the Delegates will be—

- (a) To ascertain whether in the Contracting States any direct or indirect bounty is granted on the production or export of sugars;
- (b) To ascertain whether the States referred to in Article VI. continue to conform to the special condition laid down in that Article;
- (c) To ascertain whether any bounties exist in the non-Signatory States, and to estimate the amount for the purposes of Article IV.;
- (d) To pronounce an opinion on contested points;
- (e) To consider requests for admission to the Union made by States not having taken part in the present Convention.

The Permanent Bureau shall collect, translate, arrange, and publish information of all kinds respecting legislation on and statistics of sugar, not only in contracting countries, but in all other countries as well.

In order to insure the execution of the preceding provisions, the High Contracting Parties shall transmit, through the diplomatic channel to the Belgian Government, which shall forward them to the Commission, the Laws, Orders, and Regulations on the taxation of sugar which are or may be in force in their respective countries, as well as statistical information relative to the object of the present Convention.

Each of the High Contracting Parties may be represented on the Commission by a Delegate, or by a Delegate and Assistant Delegates.

Austria and Hungary shall be considered separately as Contracting Parties.

The first meeting of the Commission shall be held in Brussels, under the auspices of the Belgian Government, at least three months before the coming into force of the present Convention.

The Commission shall have only the duty of examination and report. It shall draw up a report on all questions submitted to it, and forward the same to the Belgian Government, which shall communicate it to the Powers interested, and, at the request of any one of the High Contracting Parties, shall convoke a Conference, which shall take such decisions or measures as circumstances demand.

The examinations and valuations referred to in paragraphs (b) and (c) will, however, be binding on the Contracting Powers; they will be determined by a majority vote—each Contracting Party having one vote—and they will take effect in two months' time at the latest. Should one of the Contracting Parties consider it necessary to appeal against a decision of the Commission, the said Party must, within eight days of the receipt of the said decision, require a fresh meeting of the Commission, which will hold a special meeting and will pronounce its final decision within one month of the date of the appeal. The new decision shall take effect, at latest, within two months of its promulgation. The same course will be followed with regard to the consideration of demands for admission provided for in paragraph (e).

The expenses incurred on account of the establishment and working of the Permanent Bureau and of the Commission—excepting the salaries or expenses of the Delegates, who will be paid by their respective countries—shall be borne by all the Contracting States, and shall be divided among them in a manner to be determined by the Commission.

ARTICLE VIII.

The High Contracting Parties undertake for themselves and for their Colonies or Possessions, an exception being made in the case of the self-governing Colonies of Great Britain and the British East Indies, to take the necessary measures to prevent bounty-fed sugars, which have passed in transit through a contracting country, from enjoying the advantages of the Convention on the market to which it is being forwarded. The Permanent Commission will make the necessary proposals with regard to this provision.

ARTICLE IX.

States which are not Parties to the present Convention will be admitted to adhere to it at their request, and after approval by the Permanent Commission.

The request shall be addressed through the diplomatic channel to the Belgian Government, who will undertake, should occasion arise, to notify the adhesion to all the other Governments. It will entail agreement to all the charges and admission to all the advantages stipulated by the present Convention, and will produce its effects from the 1st September following the despatch of the notification by the Belgian Government to the other Contracting States.

ARTICLE X.

The present Convention will come into force on the 1st September, 1903.

It will remain in force for five years from that date, and in the case of any of the High Contracting Parties not having notified, twelve months before the expiration of the said period of five years, its intention of ceasing to abide by it, it will continue to remain in force for a year, and so on, from year to year.

In the event of one of the Contracting Parties denouncing the Convention, such denunciation will only have effect on the Party in question; the other Parties will retain, until the 31st October of the year in which the denunciation is made, the right of notifying their intention of withdrawing on the 1st September of the succeeding year. If one of these latter Powers desires to withdraw, the Belgian Government will summon a Conference at Brussels within three months to decide upon the course to be taken.

ARTICLE XI.

The provisions of the present Convention will apply to the oversea Provinces, Colonies, and Foreign Possessions of the High Contracting Parties. The British and Dutch Colonies and Possessions are excepted, save as regards the provisions forming the subject of Articles V. and VIII.

The position of the British and Dutch Colonies and Possessions is, moreover, regulated by the Declarations inserted in the Final Protocol.

ARTICLE XII.

The fulfilment of the mutual engagements contained in the present Convention is subordinated as far as it is necessary to the completion of the formalities and requirements established by the Constitutional laws of each of the Contracting Parties.

The present Convention shall be ratified, and the ratifications shall be deposited at the Ministry of Foreign Affairs at Brussels on the 1st February, 1903, or earlier if possible.

It is agreed that the present Convention shall only become binding if it is ratified at least by those of the Contracting Powers who are not included in the exceptional provision of Article VI. Should one or several of these Powers not have deposited their ratifications by the date mentioned, the Belgian Government shall immediately take steps to obtain a decision on the part of the other Signatory Powers as to whether the present Convention shall come into force among themselves.

In faith whereof the respective Plenipotentiaries have signed the present Convention.

Done at Brussels, in single copy, 5th March, 1902.

(Signatures of the Plenipotentiaries follow.)

Final Protocol.

In proceeding to the signature of the Sugar Convention concluded this day between the Governments of Germany, Austria-Hungary, Belgium, Spain, France, Great Britain, Italy, the Netherlands, and Sweden, the undersigned Plenipotentiaries have agreed as follows:—

As regards Article III.

Considering that the object of the surtax is the efficacious protection of the market of each producing country, the High Contracting Parties reserve to themselves the right, each one as concerns itself, to propose an increase of the surtax, should considerable quantities of sugar from one of the Contracting States find their way into their territories. This increase would only apply to sugars coming from that State.

Such a proposal must be addressed to the Permanent Commission, which will decide, as quickly as possible, by a majority vote, whether there is good ground for the proposed measure; as to the period for which it shall be enforced; and as to the extent of the increase; the latter shall not exceed 1 fr. per 100 kilogrammes.

The assent of the Commission shall only be given when the invasion of the market in question is the consequence of an actual economic inferiority, and not the result of factitious increase in price brought about by an agreement between producers.

As regards Article XI.

(A.) 1. The Government of Great Britain declares that no bounty, direct or indirect, shall be granted to sugars of the Crown Colonies during the duration of the Convention.

2. It also declares, as an exceptional measure, and reserving in principle entire liberty of action as regards the fiscal relations between the United Kingdom and its Colonies and Possessions, that during the duration of the Convention no preference will be granted in the United Kingdom to Colonial sugars as against sugars from any of the Contracting States.

3. It finally declares that the Convention shall, by its intermediary, be submitted to the self-governing Colonies and to the East Indies, so that they may have an opportunity of giving their adhesion to it.

It is understood that the Government of His Britannic Majesty has the power to adhere to the Convention on behalf of the Crown Colonies.

(B.) The Government of the Netherlands declares that during the duration of the Convention no bounty, direct or indirect, shall be granted to sugars from the Dutch Colonies, and that such sugars shall not be admitted into the Netherlands at a lower Tariff than that applied to sugars from any of the Contracting States.

The present Final Protocol, which will be ratified at the same time as the Convention concluded this day, will be regarded as forming an integral part of the Convention, and will have the same force, value, and duration.

In faith whereof the undersigned Plenipotentiaries have drawn up the present Protocol.

Done at Brussels, the 5th March, 1902.

(Signatures of the Plenipotentiaries follow.)

IN THE MEANTIME.

The Sugar Convention may or may not be ratified. But what is to become of the sugar industry in the meantime? Those who are unacquainted with the facts will, of course, reply that 18 months is not long to wait, and that those who have survived bounties for 30 years can easily hold out till September, 1903.

But the facts say exactly the reverse. A new factor in the sugar question has sprung up within the last 2 years. A bounty is now obtained by means of the Cartels in Germany and Austria, which amounts to between 8s. and 9s. per cwt. of sugar consumed in those countries; in other words, about equal to the value of the sugar.

To be more precise, the German Cartel bounty at the present time is equal to an annual grant to the sugar manufacturers and refiners in Germany of £5,500,000, which, divided over the sugar exported from that country, amounts to a bounty on export of nearly 5s. 6d. per cwt. The Austrian Cartel bounty amounts to about 4s. 6d. per cwt. of sugar exported.

These, then, are the amounts with which the German and Austrian producers and refiners can afford to undersell all competitors in the sugar markets of the world. They have a grand opportunity of crushing their adversaries, and they mean to make the most of it during the next 18 months. There is a great glut of sugar, prices have already fallen far below the natural cost of production, and sugar planters are in despair. But in the meantime the German and Austrian producers and refiners have a practically inexhaustible fund still left with which to crush and extinguish their rivals.

That they mean to do it is not only proved by the present course of the sugar market, but also by their own unguarded utterances. Dr. von Lippmann,

one of the greatest sugar experts in Europe, and a moving spirit in the German Cartel, says—

“Thanks to our internal organisation (the Cartel) we can sell sugar at a low price abroad, and ruin foreign competition. It is at this that we must aim, low prices.”

The price of raw beetroot sugar has already been forced down in this way to nearly 6s. per cwt. That is almost sufficient to carry out Dr. von Lippmann's object; but they still have 2s. per cwt. left to play with, so that they can carry on the game till the death of their victim is no longer in doubt. The only way to save the British sugar industry is to countervail, without a moment's delay, the whole Cartel bounty. Any half-measure will be absolutely useless, as proved by the figures and facts above stated.

MANGOES AND CASSAVA ON THE LOWER RUSSELL, NORTH QUEENSLAND.

H. F., Harvey Creek, Lower Russell, writes:—I wrote to your Department some years ago, asking if you knew the reason why mangoes never bear fruit in this district, the circumstance being remarkable in the fact that they bear well in the adjoining district, the Mulgrave, every year. You gave the several probable reasons, also the opinions from other fruit experts, but I cannot recollect whether they were correct or otherwise, it being several years back. What I wish to inform you now is, that we have had a heavy crop of mangoes this year, the first for about ten years. Ten years ago we had a light crop of mangoes. We have had less rain this year than usual, which may be the cause of it. The above effect is not on one selection only, but the entire district, comprising Figtree, Harvey, Frenchman's, and Babinda Creeks.

I also see a discussion has been going on in your *Journal* re cassava. I will state my experience regarding cassava, as it may be of some use to your readers. Cassava has been growing on this river for the last sixteen years to my knowledge, and I have never heard of any pigs or stock being poisoned by it. About five or six years ago we grew about 2 acres of it for pigs, and we used to throw it into the pigyard without any preparation whatever, tops as well as roots, no peeling or boiling, and we never lost a single pig. We found it a good food for pigs, but had to give it up at last owing to millions of small shiny black beetles attacking it and devouring all the leaves (cockchafer, I hear they call them). The cassava, I am certain, encouraged and harboured the cockchafer, for since we gave up growing it we have not been troubled with the beetles. The cassava was grown on decomposed granite soil and river loam.

IRRIGATION EXPERIMENTS.

SUGAR-CONTENT OF CANE-JUICE INCREASED BY IRRIGATION.

Could we be assured of moisture at the proper time, there would be no finer soils for general farming than these of North Louisiana. Their light texture makes them easy of cultivation, and possessing, as they do, a close clay subsoil, that prevents excessive leaching, it would be an easy matter to so build them up that they would be productive. Their poor water-holding power and our frequent drouths are serious bars to this accomplishment. By means of irrigation the Great American Desert has been wiped from the face of the map, and to-day there are no better farming soils, and none that produce larger or surer crops, than these that twenty years ago were considered valueless. With the view of investigating the possibility of applying irrigation to these soils, a small plat was set apart for this purpose, and was planted in the various

crops given in the table. One-half of each crop was irrigated whenever a soil analysis showed the moisture content to be below that required for the crop. These were—For cane, 25 per cent.; corn, 10 to 12 per cent.; sorghum, 8 to 10 per cent.; cotton and cowpeas, 6 to 8 per cent.; tobacco, 8 to 10 per cent.; and water melons, 4 to 6 per cent. The following table gives the yields of both irrigated and unirrigated crops for three years:—

From this it is seen that irrigation has for the three years given an average increase of 11·5 tons cane, 10·9 bushels corn, 1,309 lb. stover, 8 tons sorghum, 268 lb. cotton, 187 lb. tobacco, 12 bushels peas, and 4,203 lb. water melons. At the ordinary values of these crops, there has been an average money gain, by irrigation, of 39·20 dollars on cane, 6·91 dollars on corn, 8 dollars on sorghum, 8·55 dollars on cotton, 9·35 dollars on tobacco, 18 dollars on peas, and 10 dollars on water melons. There has been an average profit on all crops of 14 dollars, despite the fact that nearly sufficient moisture fell in 1900 for the need of the growing crops. The large increase in the cane and peas is especially noticeable. The plats were small, and it was not possible to keep an account of the cost of the work.

WATER USED BY EACH CROP, 1901.

			Sugar-cane.	Corn.	Sorghum.	Cotton.	Tobacco.	Cow Peas.	Water Melons.
By rainfall	...	...	17·69	13·92	13·92	17·69	10·05	17·69	10·05
Irrigation	...	...	11·71	4·24	1·71	1·01	1·82	1·01	1·01
TOTAL	...	...	29·40	18·16	15·63	18·70	11·87	18·70	11·06

From this it is seen the cane and cotton, the two longest growing crops, required the most moisture. The cane, however, required the largest amount of artificial moisture; while cotton, together with peas and water melons, required the smallest quantity. Corn comes next in amount of artificial moisture.

Analysis of Irrigated and Unirrigated Cane.—The sugar-cane gave the following analysis:—

	Total Solids.	Sucrose.	Glucose.	Glucose Ratio.
Irrigated	... 16·0	... 13·4	... 1·43	... 10·67
Unirrigated	... 14·1	... 11·3	... 1·51	... 13·36

Thus showing that the irrigation not only increased tonnage, but also caused an increase in sugar content.—*Bulletin of the North Louisiana Experiment Station.*

SHOEING A KICKING HORSE.

A simple method of preventing a horse kicking while being shod is described as follows:—The horse's head and tail are connected by means of a rope fastened to the tail, and then to the bit, and then pulled tight enough to draw the head a little to one side. This, it is said, makes it absolutely impossible for the horse to kick on the side on which the rope is. When one side is shod the rope is attached to the other side, when the shoeing can be completed. A horse which formerly had to be tied and thrown for shoeing allowed the smith to shoe him without attempting to kick while secured in the manner described. This sounds something like a Yankee yarn, but it is very simple, and can be easily tested by those who possess an animal that will not allow its feet to be picked up in a shoeing forge.

Statistics.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE TOTAL RAINFALL FOR EACH MONTH OF THE YEAR IN THE AGRICULTURAL DISTRICTS OF QUEENSLAND.

STATIONS.	1902.											1903.	
	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.
<i>North.</i>													
Bowen ...	2.19	2.01	0.68	Nil.	0.44	0.11	0.02	Nil.	0.06	0.06	3.16	1.66	7.65
Cairns ...	12.90	11.43	3.48	2.34	4.97	3.87	0.95	Nil.	0.16	1.38	5.15	21.32	10.28
Geraldton ...	16.87	7.55	12.83	5.39	8.10	7.32	1.77	Nil.	0.29	0.44	5.53	38.94	17.24
Herberton ...	5.77	3.86	1.54	1.07	1.58	2.05	0.08	Nil.	0.93	1.13	7.02	6.88	3.69
Hughenden ...	2.02	0.53	*	Nil.	Nil.	Nil.	Nil.	Nil.	0.05	0.22	2.77	1.52	0.99
Kamerunga ...	10.59	14.24	3.40	2.63	5.12	4.00	0.81	Nil.	0.29	1.57	3.79	20.36	10.82
Longreach ...	0.27	0.18	0.03	0.03	Nil.	Nil.	0.05	Nil.	Nil.	1.27	1.56	1.81	0.09
Lucinda ...	11.38	2.67	1.78	*	0.63	0.21	0.45	Nil.	0.22	0.10	2.47	17.43	11.66
Mackay ...	8.43	4.41	6.73	1.26	2.33	0.59	0.80	Nil.	0.17	0.35	7.71	10.45	6.47
Rockhampton ...	1.36	1.68	0.21	Nil.	Nil.	Nil.	0.09	1.41	0.05	0.51	5.60	0.92	1.68
Townsville ...	3.14	1.61	0.35	0.04	0.10	Nil.	0.10	Nil.	0.29	0.08	6.50	4.06	8.11
<i>South.</i>													
Barcaldine ...	0.07	0.37	0.02	Nil.	Nil.	Nil.	0.08	0.02	0.21	0.95	6.41	3.73	0.40
Beenleigh ...	1.82	0.68	0.42	Nil.	0.11	0.62	0.49	0.28	2.92	3.36	1.83	1.88	4.77
Biggenden ...	0.83	1.80	0.65	Nil.	0.04	0.08	0.04	1.58	2.34	0.25	8.93	2.25	3.15
Blackall ...	0.34	0.34	0.05	Nil.	0.01	0.01	0.21	0.27	0.12	1.05	4.61	3.04	1.50
Brisbane ...	2.67	0.76	0.17	0.47	0.06	0.55	0.98	1.30	3.42	2.59	1.82	1.31	5.35
Bundaberg ...	0.75	1.99	0.43	0.02	Nil.	0.07	0.13	0.31	1.24	0.65	1.38	0.97	2.60
Caboolture ...	2.66	1.29	1.99	Nil.	0.03	0.20	0.05	1.09	2.30	3.17	1.74	5.15	3.42
Charleville ...	0.22	0.42	0.23	Nil.	0.12	Nil.	1.04	0.30	1.05	2.14	4.79	1.70	0.43
Dalby ...	0.20	0.30	2.00	Nil.	0.15	Nil.	0.41	0.70	3.14	2.79	3.29	1.28	1.22
Emerald ...	1.11	0.97	0.30	Nil.	0.01	Nil.	Nil.	0.02	0.01	1.58	8.42	2.30	2.49
Esk ...	1.06	0.75	1.25	Nil.	0.04	0.25	0.15	0.64	0.93	4.00	7.67	1.32	3.51
Gatton College ...	1.58	0.26	*	0.04	0.03	0.04	0.64	0.73	2.41	3.72	5.14	3.68	3.81
Gayndah ...	0.51	0.99	0.81	0.29	Nil.	Nil.	0.05	0.64	2.10	2.08	3.37	0.77	2.08
Gindie ...	1.46	0.78	0.47	Nil.	Nil.	Nil.	0.10	Nil.	1.65	7.14	1.43	3.15	3.15
Goondiwindi ...	0.75	1.20	0.06	0.02	0.41	Nil.	1.19	0.21	1.50	0.69	2.21	1.84	0.72
Gympie ...	1.65	2.33	1.09	0.23	Nil.	0.36	0.94	1.38	3.80	1.40	4.32	2.40	3.27
Ipswich ...	2.80	0.32	0.03	0.02	0.15	0.31	0.77	0.30	2.86	3.45	1.84	1.36	5.55
Laidley ...	1.94	0.39	0.10	0.20	0.06	Nil.	0.40	0.89	2.21	3.27	5.13	0.71	3.63
Maryborough ...	0.75	0.95	1.57	0.96	0.24	0.29	0.57	0.69	0.91	1.11	4.02	2.09	2.76
Nambour ...	2.06	1.61	†	0.26	0.04	*	0.70	0.35	1.26	1.66	2.64	2.53	5.03
Nerang ...	4.54	0.65	0.65	0.35	0.52	1.07	1.22	1.17	3.15	1.75	1.73	3.36	4.73
Roma ...	1.11	0.54	0.15	Nil.	0.20	Nil.	0.46	0.35	0.92	0.86	2.35	0.75	0.15
Stanthorpe ...	0.51	0.56	0.10	0.87	0.78	0.15	0.94	0.95	2.29	3.98	1.75	0.23	1.59
Tambo ...	0.35	0.68	0.04	Nil.	0.01	Nil.	0.28	0.06	0.41	1.34	4.14	2.43	0.15
Taroom ...	1.82	1.30	0.33	Nil.	Nil.	Nil.	0.17	0.45	0.68	1.40	2.88	4.32	1.53
Tewantin ...	1.13	3.44	2.84	0.80	0.91	0.91	0.85	0.87	1.94	1.96	1.35	1.90	5.30
Texas ...	1.62	0.42	Nil.	Nil.	0.88	Nil.	1.57	0.13	2.42	1.67	1.42	0.18	0.94
Toowoomba ...	1.20	Nil.	0.79	0.03	0.38	0.19	0.56	0.37	3.07	3.18	6.99	2.21	3.42
Warwick ...	0.65	0.55	Nil.	0.15	0.63	0.20	0.94	0.43	2.96	2.87	4.61	0.68	2.59
Westbrook ...	1.04	0.06	0.41	Nil.	0.28	0.06	0.29	0.38	3.20	3.34	3.37	4.21	2.70

CLEMENT L. WRAGGE,

Wragge's Weather Bureau.

PRICES IN BRITISH MARKETS OF ARTICLES WHICH CAN BE PRODUCED IN QUEENSLAND.

BUTTER.—New Zealand, choicest, 112s. to 114s.; Danish, choicest, 110s. to 114s., finest, 108s. to 112s.; Canadian, choicest, 102s. to 104s., finest, 94s. to 104s.; Australian, finest, 112s. to 114s. per cwt.

CHEESE (duty free).—American, 62s. to 63s.; Canadian, 82s. to 84s.; New Zealand, 63s. to 64s. per cwt. Australian, none.

CONDENSED MILK.—18s. 6d. to 20s. 6d. per case in 20-case lots.

SUGAR (duties, raw, 2s. to 3s. 10d. per cwt.; refined, 4s. 2d. and $\frac{1}{2}$ per cent.).—Refined, £15 to £16; raw, £10 to £14 per ton; German beet, 88 per cent., 8s. 1d. per cwt.

MOLASSES (duty, 2s. per cwt. and $\frac{1}{2}$ per cent.).—6s. to 6s. 6d. per cwt.

RICE (duty 5d. per cwt.).—Rangoon, £9 to £15; Japan, £13 to £16; Java, £20 to £25; Patna, £18 to £22 per ton.

COFFEE (in bond, duty 1½d. per lb. and ¼ per cent.).—Ceylon plantation, 50s. to 102s.; peaberry, 74s. to 123s.; Santos, 29s. to 50s.; Mocha, 55s. to 106s.; Jamaica, 100s. to 130s. per cwt.

ARROWROOT (duty, 5d. per cwt.).—Bermuda, 1s. 3d. to 1s. 6d.; St. Vincent, 3d. to 5½d.; Natal, 6d. to 7d. per lb.

WHEAT.—Manitoba, 34s. to 34s. 6d. per 496 lb.

FLOUR.—30s. to 31s. per 280 lb.

MALTING BARLEY.—27s. 6d. to 30s. per 448 lb.

OATS.—New Zealand, 26s. to 28s. per 384 lb.

SPLIT PEAS.—45s. per 504 lb.

GINGER.—Japan, 33s. to 34s.; Jamaica, 50s. to 55s. per cwt.

PEPPER.—Black, 5½d. to 6½d.; white, 9⅜d. to 9½d. per lb.; capsicums, 16s. to 80s.; chillies, 30s. to 35s. per cwt.

TOBACCO.—Strips: Western—Fillers, 5d.; rather short, 5½d. to 5¾d.; very middling to middling, 6d. to 6¾d.; good to fine, 7d. Burley, 5¾d. to 8d. Virginia Dark—Fillers, 5½d. to 6d.; rather short, 6d. to 6½d.; very middling to middling, 6½ to 7½d.; good to fine, 8d. to 10d. Virginia and Carolina Bright—Semi-dark, 7½d.; semi-bright, 8½d. to 9d.; medium or mixed, 10d. to 11d.; good to fine, 11½d. to 12½d. to 14d. Leaf: Western—African export, 5d. to 6½d.; short trade, 4d.; medium to good trade, 4½d. to 6d. Burley, 6d. to 7d. to 8d. Virginia Dark—medium trade, 4d. to 5d.; good to fine trade, 5½d. Virginia and Carolina Bright—common or semi-bright, 8d.; medium or mixed, 8½d. to 10d.; good to fine, 11d. to 12d. to 15d.

WINES.—Australian Burgundy, red, 18s. per dozen; quart flagons, 17s. to 23s. per dozen.

GREEN FRUIT.—Oranges, 6s. for common to 33s. for finest selected per case; lemons, 12s. to 16s. per case; bananas, 8s. to 12s. per bunch; apples, American, 17s. to 18s. per case; grapes, 13s. to 30s. per barrel; pineapples, 3s. to 5s. each.

COTTON.—Uplands, 4½d.; Sea Island, 8d. to 9d. per lb.

COTTON SEED.—No quotation.

COTTON-SEED OIL CAKE.—£4 7s. 6d. to £4 10s. per ton.

COTTON-SEED OIL.—22s. 3d. to 23s. 9d. per cwt.

LINSEED.—47s. per quarter.

LINSEED OIL.—24s. 3d. to 24s. 9d. per cwt.

LINSEED OIL CAKE.—£7 5s. to £7 7s. 6d. per ton.

MANILLA HEMP.—£28 to £31 per ton.

NEW ZEALAND HEMP.—£31 per ton.

SISAL HEMP.—£35 per ton.

FROZEN MEAT.—The following are the Frozen Meat Trade Association's Smithfield market quotations for the undermentioned classes of frozen meats, based on actual sales of not less than 100 carcasses of mutton or lamb, or 25 quarters of beef of fair average quality. These quotations are not for selected lines, but for parcels fairly representative of the bulk of the shipments now on the market:—

New Zealand Sheep.

(Crossbred Wethers and Maiden Ewes.)

	March 14.	March 21.
Canterbury, light (48 lb. to 56 lb.)	5d.	5d.
Canterbury, medium (56 lb. to 64 lb.)	4¾d.	4¾d.
Canterbury, heavy (64 lb. to 72 lb.)	4½d.	4½d.
Dunedin and Southland (56 lb. to 64 lb.)	4½d.	4½d.
North Island (55 lb. to 65 lb.)	3¾d.	3¾d.

Australian Sheep.

(Crossbred and Merino Wethers.)

		March 14.	March 21.
Heavy (over 50 lb.)	... ..	3 $\frac{5}{8}$ d.	3 $\frac{5}{8}$ d.
Light (under 50 lb.)	... ..	3 $\frac{1}{2}$ d.	3 $\frac{1}{2}$ d.

River Plate Sheep.

(Crossbred and Merino Wethers.)

Heavy (over 50 lb.)	... ..	3 $\frac{5}{8}$ d.	3 $\frac{5}{8}$ d.
Light (under 50 lb.)	.. ..	3 $\frac{1}{2}$ d.	3 $\frac{1}{2}$ d.

New Zealand Lambs.

Canterbury, light (28 lb. to 36 lb.)	6d.	5 $\frac{7}{8}$ d.
Canterbury, heavy (36 lb. to 42 lb.)	6d.	5 $\frac{7}{8}$ d.
Dunedin and Southland (28 lb. to 42 lb.)	... ..	5 $\frac{7}{8}$ d.
North Island (28 lb. to 42 lb.) new season's...	5 $\frac{11}{16}$ d.

Australian Lambs.

30 lb. to 40 lb.	5 $\frac{1}{4}$ d.
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River Plate Lambs.

30 lb. to 40 lb.	5 $\frac{1}{8}$ d.
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New Zealand Frozen Beef.

Ox, fores (180 lb. to 220 lb.)	3 $\frac{1}{2}$ d.
Ox, hinds (180 lb. to 220 lb.)	4 $\frac{1}{8}$ d.

Australian Frozen Beef.

Ox, fores (160 lb. to 200 lb.)	... ..	None offering.
Ox, hinds (160 lb. to 200 lb.)	... ..	None offering.

River Plate Frozen Beef.

Ox, fores (160 lb. to 220 lb.)	... ..	3 $\frac{7}{8}$ d.
Ox, hinds (160 lb. to 220 lb.)	... ..	3 $\frac{1}{16}$ d.

(All quotations for beef are nominal.)

EGGS.—French, 13s. 6d. to 14s.; Danish, 11s. to 14s. per 120.

BACON.—Irish, 58s. to 61s.; American, 46s. to 48s.; Canadian, 52s. to 53s. per cwt.

HAMS.—Irish, 76s. to 90s.; American, 49s. to 54s. per cwt.

TALLOW.—Beef, fine, £35 5s.; medium, £31; mutton, fine, £34 10s. medium, £31 10s. per ton.

COPRA (cocoanut kernel).—£15 15s. to £16 10s. per ton; £8 to £9 per ton at the South Sea Island trading stations. Corresponding value in Queensland, £10 to £12 per ton.

COCOANUT OIL.—£34 10s. to £35 per ton.

MARSUPIAL SKINS.—Offered: Opossum, 1,713,054; bear, 58,066; wallaby, 312,886; kangaroo, 11,632; cat, &c., 18,978; fox, 7,211; emu, 1,111—2,122,938 skins. Sold: Opossum, 1,624,037; bear, 56,047; wallaby, 275,650; kangaroo, 10,947; cat, &c., 17,636; fox, 7,211; emu, 1,111—1,992,639 skins. The prices realised are as follow:—1st extra large blue, 1s. 1d. to 2s. per skin; 2nd extra large blue, 9 $\frac{1}{4}$ d. to 1s. 4 $\frac{1}{2}$ d.; 1st blue, 10 $\frac{1}{4}$ d. to 1s. 5d.; 2nd blue, 9d. to 1s. 1 $\frac{1}{2}$ d.; small blue, 4d. to 1s. 3 $\frac{1}{2}$ d.; 1st extra large red, 1s. to 1s. 6d.; 2nd extra large red, 8d. to 1s. 1 $\frac{1}{2}$ d.; 1st red, 7 $\frac{3}{4}$ d. to 1s.; 2nd red, 6 $\frac{3}{4}$ d. to 9 $\frac{3}{4}$ d.; small red, 4d. to 8d.; 3rds, 3 $\frac{3}{4}$ d. to 8d.; 1st Victorian, 3s. 3d. to 4s. 3d.; 2nd Victorian, 1s. 9d. to 2s. 6d.; 3rd Victorian, 10 $\frac{1}{2}$ d. to 1s. 3d.; 1st grey Tasmanian, 2s. 3d. to 2s. 11d.; 2nd grey Tasmanian, 1s. to 2s. 2d.; black Tasmanian, 1s. 8d. to 7s. 6d.; swamp wallaby, large and extra large (furriers'), 2s. 8d. to 3s. 4d.; swamp wallaby, middling and small, 1s. 1d. to 3s. 2d.; swamp wallaby (tanners'), 6d. to 1s. 11d.; Tasmanian wallaby, 2d. to 2s. 11d.; kangaroo wallaby, 2d. to 3s. 3d.; wallaby, 2d. to 5 $\frac{1}{4}$ d.; rock wallaby, 2d. to 6d.; kangaroo, 5d. to 1s. 6d.; emu, 1s. 3d. to 2s. 9d.

General Notes.

VALUE OF QUEENSLAND TIMBERS IN LONDON.

From Messrs. Churchill and Sim's Wood Circular we take the following values of some of the timbers which can be supplied from many parts of Queensland:—

Cedar (Honduras and Mexican), from 4d. to 4½d. per foot. * African cedar is not in demand owing to its hardness and want of odour, two disqualifications which recommend the Queensland cedar for preference, as it is soft and highly odoriferous. There is little Australian cedar in the home market, no imports having been made for the past two years. Small parcels of well-squared logs, sound, and of large sizes would realise from 3½d. to 4d. per foot cube. Prime sizeable logs of pencil cedar would bring from 3s. 6d. to 4s. per foot cube.

Kauri pine, in plauks, from 3s. to 3s. 6d. per foot cube. Logs are difficult to sell at from 1s. to 2s. per foot cube.

Rosewood, from £6 to £11 per ton.

Queensland is rich in beautiful timbers suitable for furniture-making and for veneers. Thousands of tons of these woods are yearly being burnt off in clearing the scrubs for cultivation. Were it not for distance from the home markets and the high freights, these would find their way into consumption in England instead of being ruthlessly destroyed. Silky oak for barrel staves and yellow-wood for furniture would find a ready market, yet the former is wasted after doing duty as banana crates, and the latter is burnt off to make room for cultivation.

ICE EATING.

More people suffer serious inconvenience from drinking ice-cold drinks and from eating ice than is generally supposed. Many deaths have occurred as the result of the pernicious habit of taking iced drinks in the heat of summer. This is the way the *Scientific American* puts the matter:—

The following thermodynamical problem has been stated and solved by *Engineer*:—

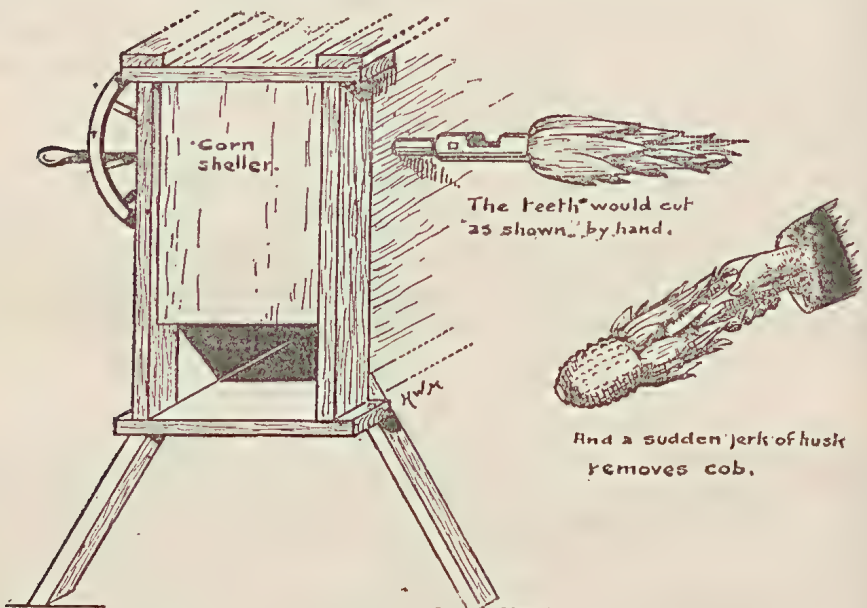
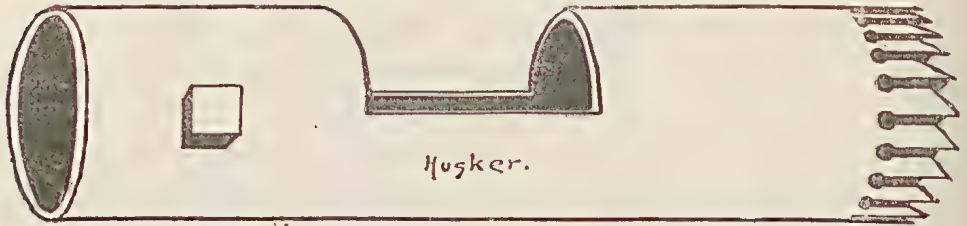
A boy eats 2 oz. of ice. Let us see what is the thermodynamic equivalent of the work he has made his interior do, assuming that he takes five minutes to eat it. To melt the ice will require 18 units to reduce it to water. To raise it in temperature to that of his inside, he will require 7 more units, or a total of 25 British thermal units. Taking the mechanical equivalent of 177 foot pounds, this will be equal to 19,425 foot pounds. If the boy weighs 100 lb., he will have given his stomach as much hard work to do as would, with a machine having unit efficiency, raise him 194 feet high, the rate of heat extraction being equal to nearly $\frac{1}{8}$ -horse power. There are some boys who eat more than a pound of ice in a day. Is it any wonder they become dyspeptic and tired?

POSTAGE ON THE "JOURNAL."

As there still appears to be some misconception on the part of recipients of the *Journal* with regard to postage, we wish to draw special attention to the notice appearing in our advertisement columns to the effect that from the 1st day of July next the amount to be remitted to the Department for postage is TWO SHILLINGS AND SIXPENCE to all recipients except those who subscribe TEN SHILLINGS per annum. Credit will be given for all amounts already paid to the end of the year.

A SIMPLE CORN-HUSKER.

Mr. H. R. Stephens, Toowoomba, sends us the following sketch and description of a simple corn-husker. He says:—As there is a considerable area of land under maize this season, it may be opportune to give a description of an expensive corn-husker which may be made out of a piece of 1-inch iron



pipe about 5 inches long, having five or six teeth formed in one end, and a piece about 2 inches long cut out to allow of clearance of husk shreadings. The husker would be fixed on to the corn-sheller spindle by means of the set screw. Mr. Stephens has given a practical test to the tool, and it cuts through the butt of the cob very well. The butt of the cobb does not pass down the pipe, of course, except sufficiently to allow the teeth to cut through the husk, which is then jerked off as shown.

TO REMOVE BROODINESS IN HENS.

An effective and yet most simple way of overcoming broodiness in hens is shown by Mr. F. C. Hare, chief of the poultry division, Department of Agriculture, Ottawa, Canada. It is to place the ambitious sitters in a swinging coop. This coop is simply a wooden frame, 2 feet square and 2 feet high, covered on the top, bottom, and sides with laths 2 inches apart. Four strings from the upper corners of the coop are tied to a central cord fastened to a nail in the roof of the poultry-house. The coop should be raised 18 inches from the ground. The excitement of the outside chickens and the swinging of the coop quickly dispel the hatching idea from the hens. These sitters should be fed and watered at the same time as the laying hens, but a liberal vegetable and meat diet will induce early laying.

WORLD'S FAIR AT ST. LOUIS, UNITED STATES, AMERICA.

In 1904 an exhibition will be held in the United States, which will be unique of its kind, especially as regards the sections of agriculture and horticulture. The building devoted to the former industry covers 20 acres, and that to horticulture 6 acres. Surrounding these two buildings are 41 acres of ground, the entire area of which has been placed in the hands of the Chief of the Department of Agriculture, Mr. Fred. W. Taylor, for planting and treatment. A remarkable feature in the arrangements is that no charge will be made for space occupied by exhibits, and power for driving machinery, steam, electricity, water or gas, will be provided free of cost to the exhibitors. Viticulture and pomology also have sections to themselves. Dairying utensils and products will be installed in the Agriculture Palace. Animal food products, insects and plant diseases, groceries, farm equipment, and the methods of improving land, with models of all kinds of farm buildings, agricultural implements, and farm machinery of every conceivable kind, and inedible agricultural products, such as textile plants, cotton, flax, hemp, ramie, and vegetable fibres of all kinds, tannin plants and seeds, dyes, hops, teasles, broom corn, wool, feather, hair, and bristles, will all find a place in the Agriculture Palace, which should provide most magnificent object lessons for the farming community, and for the public in general. There appears to be no doubt in the minds of the promoters that the World's Fair will turn out a gigantic success. We sincerely hope so.

UTILISING ROSELLAS.

Those who have grown rosellas for the first time will no doubt be glad to learn how to utilise the fruit to advantage. We therefore reprint the advice given by Mr. D. Jones, Fruit Inspector, in the May issue of the *Journal* for 1900:—

UTILISING THE FRUIT.

DRIED ROSELLAS.

Most housewives are familiar with the various uses of the rosella. For jam-making it is well adapted, making a palatable, easily-kept product, if put up in earthenware or glass. Unfortunately, rosellas contain an acid principle which precludes putting up this class of fruit in ordinary tinware, and hence some failures have been experienced in this respect. For pickles the fruit is well adapted, and it makes an excellent condiment. In my own experience, I have found that the best method of handling the fruit was to dry it after removing the pod from the capsule, which, if done with the instrument before described in this *Journal*, cuts out the covering nearly whole, which is thus better adapted for drying purposes. I have kept the dried fruit in jars and tins for two or three years in good order. Rosella-growers would do well to give this mode of preparing the fruit more attention, for I have found it far and away the best in saving the crop. All that is necessary to do in drying is to prepare the fruit as I have shown, and, in some roomy, airy position (not necessarily in the sun) place the fruit either on trays or sheets on the floor, allowing as much air to pass through and over the fruit as possible. In a few days all superfluous moisture will have evaporated, and the dried article can be packed away in jars. By this means rosellas can be had in good condition all the year round. All that is needful, when required for use for jam, tarts, &c., is to take the quantity necessary and pour over the fruit a little water, when it will absorb the water and resolve itself into apparently fresh fruit. The large grower has in this method a certain way of keeping such surplus fruit that may not be in immediate demand, or that the low prices ruling may deter him from marketing as ordinary fruit. I am of opinion that fruit put up in this form, and exported to the London market, should give better results than the already proved failures in the form of jams.

It is not commonly known that in the utilisation of the choko, now fast becoming a popular vegetable, that very pleasant tarts can be made by using that vegetable (*Sechium edule*) in conjunction with the rosella. It is well known that many object to what they term the excessive tartness of the rosella. Using it in conjunction with the choko this tartness is modified, and tends to make both these fruits more appetising. In fact, rosellas are specially adapted for blending with less tart fruit, as they give a flavour to many fruits and vegetables which otherwise would not be so acceptable for table use.

WINE-MAKING.

This is a further use for rosellas. Although I have no personal experience in this method of dealing with the fruit, I know that a good palatable beverage is made from rosellas. To those who care to try to utilise this fruit in this manner, I give here a recipe sent me by a friend who has a wide reputation as a maker of rosella wine:—

ROSELLA WINE.

Put your fruit into a cask that has one head out. Pour boiling water over the fruit, rather more than enough to cover it. Let this stand for about three days—stir now and again.

At the end of three days, strain the liquor into another cask—*this cask to have both heads in*. Then for every gallon of liquor take 3 lb. of sugar, and make a good thick syrup of same.

Pour this syrup while hot into the liquor, and stir well.

Leave the cask with the bung out until fermentation starts. Should this not occur, say, in 24 hours, add a bottle of yeast. Keep the cask in as even a temperature as possible, as this will help the fermentation.

In the process of fermentation you will lose some of your liquor. Should it ferment thoroughly, save the liquor that overflows from the bung-hole, and put it back into the cask; but should you find this not enough to keep your cask full, add a little warm water.

When the liquor has almost finished fermenting—say, when it stands a 3 degrees density by the saccharometer (Beaumè)—bung up the cask and leave for three months. Then bottle.

From *Hibiscus Sabdariffa*, fibre has been repeatedly made, specimens of which and of cloth manufactured from it are to be seen in the museum of the Agricultural Department, William street. Some few years ago a local grower gave the matter of the production of this plant considerable attention, especially in view of the utilisation of his crop for fibre purposes. I am of opinion that his failure to go on with the matter was consequent on want of machinery to prepare the fibre, which is a drawback only too patent with regard to the development of many industries of this character in Queensland.

ROSELLA JAM.

Pick the red calyx from the seed-pods; boil the the latter in sufficient water to quite cover them until the jelly is extracted and they look dry. Strain them and weigh the liquor and red fruit. Then boil the fruit in the liquor until it is quite tender. Add as much weight of sugar as there was of liquor and red fruit before the second boiling, and boil again until it becomes jelly.

A milder jam is made by not using the seed-pods, but the colour is not so good.

Boil the red fruit in sufficient water to cover it. When tender, weigh it. Add equal weight of fine white sugar, and boil till it sets.

PIG NOTES.

Professor Henry, of Wisconsin, says that it has been found that giving each pig a spoonful of bonemeal at each meal, or as much wood ashes as it will eat, effects a saving of 23 per cent. in the amount of corn required to make 100 lb. additional weight. If plenty of skim-milk is fed, there is not so much value in the bonemeal or ashes, as that contains much of the same element as the bone, but those who do not have milk would do well to remember the above facts.

SCOUR IN YOUNG PIGS.

If young pigs should show symptoms of scour, the fault will frequently be found in the milk of the sow. Change her food, and give a gentle purge of equal parts of salts and sulphur, say 2 oz. for a dose. Bran is an invaluable food, and, after farrowing, hot food, with this as a principle feature, should be fed. Keep the young pigs well oiled about the tail. They will lose them if the olive oil bottle is not kept handy.

FEEDING PRESERVED MILK TO PIGS.

A Continental journal gives the results of some experiments on the consumption by young pigs of milk which had been treated with boracic acid for preservative purposes. The experimentalist gave to six animals milk to which had been added variable doses of boracic acid, and all the animals died within three or four weeks. At the same time, six other young pigs were fed upon pure milk, and they grew rapidly, making weight to a notable degree. The animals which had milk treated with boracic acid lost their appetite in two or three days, manifested weakness, suffered from diarrhœa, and rapidly became very thin. The younger the pigs, the more injurious the milk containing boracic acid proved itself.

NO SALT FOR PIGS.

A veterinary surgeon in England lays down the dictum—"Give no salt at all to pigs," for, in his opinion, even in small quantities, it is highly dangerous to this particular animal, which seems to be quite an idiosyncrasy in this respect. Soda and soap or washing powders are almost as dangerous, and, in fact, alkalies in general, including ammonia. These are consumed very extensively in large establishments for cleaning and washing up, and supplant the old-fashioned "elbow-grease" to a great extent nowadays. These solutions find their way to the swill tub and hog tub, and with very grave results, for he has seen on one occasion twenty pigs dead at one place from salt-poisoning, and on another three fine sows dead, and another ill, from drinking soapsuds from a drain where it had run from a laundry. For many years he has lived in a large pig-breeding district, and in the course of his duties as veterinary inspector the cases of salt and soda poisoning among pigs are very frequent, and there is no doubt but that many cases that were said to be swine fever years ago were due to this cause, for the symptoms, as also *post-mortem* appearances, simulate that disease to a great extent.

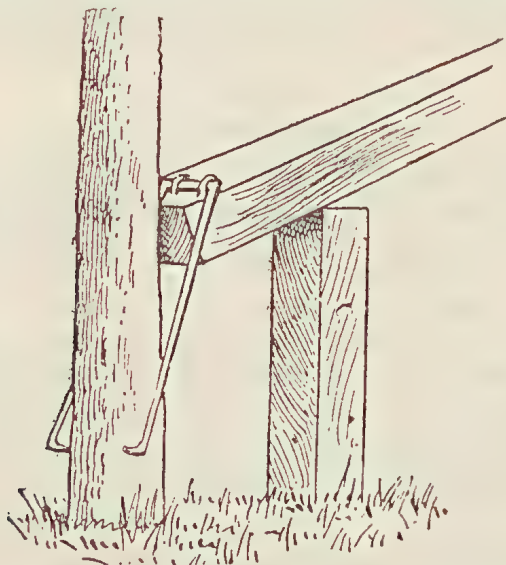
AN ENORMOUS PIG.

In the June number of this *Journal* (1900) we recorded the measurements of what was at that time probably the largest pig ever reared. It was a red Jersey boar weighing 1,609 lb. when alive, and when killed and dressed 1,336 lb.

Now we have an account of another pig of the same breed which slightly exceeds the former in weight. It was reared and killed in Essex, England. At two-and-a-half years old it weighed 1,610 lb., and killed out, dressed, 1,337 lb. It was 30 inches across the loin, 30 inches across the hams, 72 inches in girth, and 108 inches from tip of snout to end of tail. When split at the shoulders its flesh cut just 3 feet thick from rind to rind outside shoulder blades. The cheeks or jowls were nearly 24 inches wide at top. The face of the monster hog measured only 16 $\frac{3}{4}$ inches. From hip bone to toe measurement was 5 $\frac{1}{2}$ feet, or 66 inches, which gives one the idea of the size of the ham.

A SIMPLE STAKE PULLER.

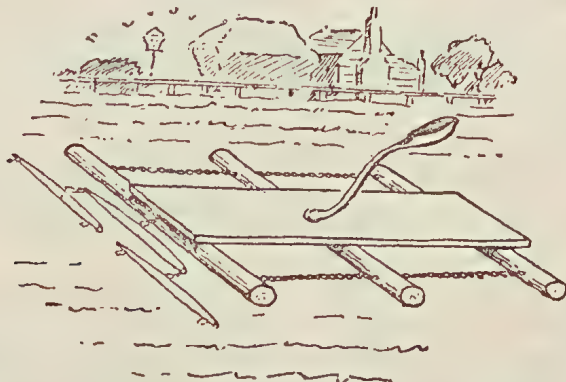
An effective and very convenient implement for pulling stakes when removing an old fence is quickly made by attaching to the end of a stout pry two round iron arms by staples, as shown in the accompanying diagram. The



iron arms are turned in at the ends and drawn to a point, so that they can be driven into the stake. Then with a small block of wood to act as a fulcrum the pry is levered and the stake is uprooted. If the stake is large, the iron arms can easily be sprung apart so that the points can be driven into the wood.

A HOME-MADE CLOD CRUSHER.

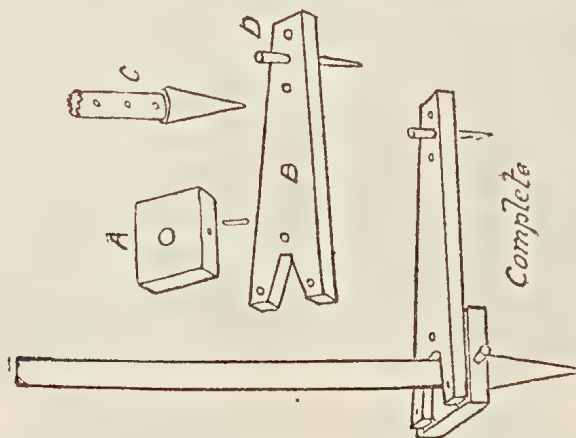
How can we make a clod crusher which will answer better than a roller, and yet level and pulverise without packing the soil? The accompanying illustration will show the character of the arrangement. It is made of three hardwood saplings, 6 inches in diameter and $7\frac{1}{2}$ feet long, fastened together about 18 inches apart by pieces of chain. For a seat a piece of board is bolted to the middle of the first sapling and allowed to extend slightly beyond the



last one. On this an old mowing-machine seat may be fastened. This arrangement will hold the seat in place, and at the same time allow the saplings to work independently. The seat can easily be removed, making it easier to store the drag when not in use. The crusher may be drawn by a short chain attached to the centre of the first sapling, or the double tree may be connected with chains from each end of it.

A LONG-HANDLED DIBBLER.

To save backache and labour a dibbler made on the principle shown in the annexed diagram will be found to be very effective. It makes the hole for the plant, and spaces at the same time. Distances of plants can be regulated by changing the little peg holes in the spacer. Depth of hole can be arranged by means of the pin through the block and handle. The block A is 8 inches



square and 1 inch thick, with a hole in the centre to suit the handle C. A small pin in the side of the block A regulates the depth of the holes of the dibbler by adjusting it in the slots of the handle. The length of the spacer block B and the number of holes for the marking peg D should be made to suit conditions. With this dibbler an operator with a fair start can keep ahead of four setters.

AGRICULTURAL AND HORTICULTURAL SHOWS.

The Editor will be glad if the secretaries of Agricultural and other Societies will, as early as possible after the fixture of their respective shows, notify him of the date, and also of any change in date which may have been decided on.

Publication Received.

"THE TRANSVAAL AGRICULTURAL JOURNAL."

We have just received the second number of the first volume of the above journal, which is now being issued by the Agricultural Department of the Transvaal. The contents are well-written, well-selected, interesting, and varied, and should prove very valuable not only to persons already engaged in rural pursuits in that colony, but to many in other countries who may be turning a longing eye on the fertile lands of a country which, under British rule, offers many inducements to settle there.

The articles on the reintroduction of poultry and on their management are well worth reading. We fail, however, to follow Mr. Hotine when he says, "an initial start of five pens is recommended, *i.e.*, ten hens and five cocks, with four small incubators. The farmer in the second year should be able to send to market over 10,000 eggs and 1,000 to 1,500 chickens. Of course the first year is devoted to building up stock." With twenty-seven hens and three cocks (Plymouth Rock and White Wyandotte) we have never had such wonderful results. We should like full particulars as to how it is done.

Answers to Correspondents.

PRICE OF EGGS IN ENGLAND.

HENWIFE, IPSWICH.—The reason or rather one of the reasons for the difference in the prices of eggs sent from foreign countries to the London market, as shown in our London price list of commodities which can be produced in Queensland, is that export eggs vary greatly in weight. The grade of egg which is in good demand in England is one weighing 15 lb. per great hundred—that is, 15 lb. per 10 dozen, which is equal to 2 oz. per egg or $1\frac{1}{2}$ lb. per dozen. Some French eggs go as high as 17 lb. per 120. For every $\frac{1}{2}$ -lb. which eggs weigh less than 15 lb. per 120 (or great hundred as it is called), the value is lessened by a halfpenny per dozen. Again, eggs should be graded. If they are exported with sizes mixed promiscuously, they will command a lower price, also if the colours are mixed. Eggs of a brown colour are preferred in the trade. Eggs, to command the highest price, should reach England during November and December, when they will realise as high as 14s. and 15s. per long hundred. For export, all eggs should be wiped clean and graded.

GRAPE AND GUAVA JELLY.

HOUSEKEEPER, GEHAM—

Grapes.—Remove the fruit from the stems, and put the berries into a stewpan. Put on the cover, and place the pan on the stove away from the fire, so as to obtain a gentle heat, which will steam the fruit and draw out the juice. Gradually bring the pan over the fire, and bring the contents to a gentle boil till all the juice is extracted from the skin. Then turn the whole into a straining-bag of cheese cloth. Tie it up and allow the juice to drain into another vessel. The bag must not be squeezed, or the jelly will be muddy. Return the juice to a clean pan, measuring the quantity with, say, a teacup. Bring it to a boil, and let it boil for 10 minutes. Then add a cupful of sugar for every cupful of juice. Stir gently till the sugar is all dissolved, then boil rapidly for 15 minutes. When the scum begins to rise in bubbles, watch it till it appears rather creamy, and is thrown to the sides of the pan. Then skim carefully from the sides, not from the centre. On this depends the proper setting and clearness of the jelly. When all scum is removed, pass through a straining-bag into warm bottles.

Guavas.—Wash the fruit well. Place in a stewpan and add just sufficient water to cover the fruit. Bring it to a boil till thoroughly soft, and all the juice is extracted. Measure the juice after straining as for grape juice, and add an equal amount of sugar. Bring to a boil, and treat as for grape jelly. You may tell when the juice is ready for setting by putting a little on a cold saucer. It will, if ready, set at once. Then remove from the fire, strain, and bottle.

PENETRATION OF ROOTS—PINEAPPLES.

A. S. SASSAUVE, Bundaberg—

1. No. Wheat roots have been found on exceptionally loose fertile soils 16 feet in length.

2. The top roots of bloodwood trees rarely exceed 7 feet in length, although the tree may be 70 or 80 feet high.

3. We have no experience of pineapple plantations sixty years of age. In the Nundah and Nudgee districts, there are pineapple plants which have not been renewed for thirty years. The planters in those districts cultivate, manure, and frequently replant. See articles now appearing in this *Journal* on Pineapple Cultivation by Mr. A. H. Benson, Instructor in Fruit Culture.

MEASURES AND WEIGHTS.

HOUSEWIFE, Pimpama.—A tumbler of ordinary size contains about 10 oz.; a teacup, 6 oz.; a wineglass, 2 oz., a tablespoon, 4 drachms; a dessert-spoon, 2 drachms; a teaspoon, 1 drachm. This table may be extended as follows:—

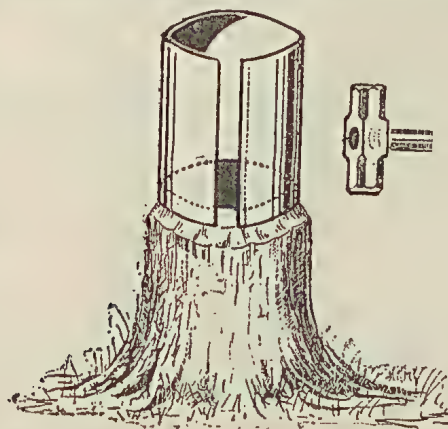
60 drops—1 teaspoonful	=	1 fl. drachm
4 teaspoonfuls—1 tablespoonful	=	$\frac{1}{2}$ fl. ounce
A wineglass	=	2 fl. ounces
A teacup—8 tablespoonfuls	=	4 fl. ounces
2 teacups— $\frac{1}{2}$ pint	=	8 fl. ounces
4 teacups—1 pint	=	16 fl. ounces
8 teacups—1 quart	=	32 fl. ounces
1 tablespoonful butter	=	1 ounce
1 tablespoonful sugar	=	1 ounce
2 tablespoonfuls flour	=	1 ounce
1 quart sifted flour	=	1 pound
1 pint granulated sugar	=	1 pound
1 pint ordinary liquid	=	1 pound
1 pint solid chopped meat	=	1 pound
1 cupful stemmed raisins	=	6 ounces
1 cupful dried currants	=	6 ounces
8 tablespoonfuls flour	=	1 cupful
8 tablespoonfuls sugar	=	1 cupful
8 tablespoonfuls butter	=	1 cupful
1 breakfast cup	=	1 half-pint
1 breakfast cup sugar	=	$\frac{1}{2}$ pound

BOX UNDERGROWTH.

J. A. SAVAGE, Cranbourne.—The best way to get rid of box undergrowth is to use axe and grubber. There is no chemical which it would pay you to use to destroy the roots. It is the worst of all woody undergrowth to deal with. Ringbarking is a useless labour.

CRUSHING GREEN BONES.

J. WESTERTON, Normanby.—If you cannot afford to buy a green-bone cutter, price about £1 10s., try the plan here illustrated. On a solid block or stump fix a cylinder of tin or galvanised iron, having a perpendicular opening



about 3 inches wide. Put the green bones on to the block and smash them with a sledge hammer. The handle passes through the slit, and the tin keeps the bones from scattering. A still better plan is to have a top to the tin cylinder with a wide hole in it. Instead of the hammer, use an iron-headed rammer, and work it as you would a churn.

HEATING VALUES OF FUEL.

WOODMAN, Euri Creek.—In further reply to your questions, we are now able to give you the following:—

Pounds of water evaporated by 1 lb. of fuel.

Straw	...	...	1.9	Coke or Charcoal	...	6.4
Wood	...	...	3.1	Coal	...	7.9
Peat	...	...	3.8	Petroleum	...	14.6

HAND ROCK-BORING MACHINE.

W. COURTNEY, Kelvin Grove, Mackay.—A machine such as you require may be bought for about £15 from the principal engineers and foundries. Apply to the Harbour Board, Mackay. You might be able to hire a machine from the Hydraulic Engineer's Department capable of drilling to a depth of 50 feet.

TIMBER FOR A CULVERT.

"TYSON," Woombye.—The safe load to take across your proposed culvert will depend upon the timber you use, its dimensions, its soundness, and the width of span. The span being 30 feet, you should use ironbark or grey box. The load which may safely be placed on the centre of a stringer of these timbers, 12 in. by 12 in. by 30 feet in length, is 4,800 lb. If you make two spans over the gully, each span will safely carry 9,600 lb., or 4.28 tons.

Red gum of the same dimensions will only carry over a 30-foot length, 3,200 lb., and over a 15-foot length, 6,400 lb.

DUCKS DYING.

DUCK, Geraldton.—See answer to W. W. in this column, 1st March, page 219.

Times of Sunrise and Sunset, 1903.

DATE.	JANUARY.		FEBRUARY.		MARCH.		APRIL.		PHASES OF THE MOON.
	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.	
1 ...	5.0	6.42	5.25	6.39	5.45	6.17	6.1	5.43	7 Jan.) First Quarter 7 57
2 ...	5.0	6.42	5.25	6.38	5.46	6.16	6.1	5.42	14 " ○ Full Moon 0 17
3 ...	5.1	6.42	5.25	6.38	5.46	6.14	6.3	5.40	20 " ☾ Last Quarter 9 49
4 ...	5.1	6.42	5.27	6.37	5.47	6.13	6.3	5.38	29 " ● New Moon 2 39
5 ...	5.3	6.43	5.28	6.36	5.48	6.12	6.4	5.38	
6 ...	5.3	6.43	5.29	6.36	5.49	6.11	6.5	5.37	
7 ...	5.3	6.43	5.31	6.34	5.49	6.9	6.6	5.36	5 Feb.) First Quarter 8 13
8 ...	5.5	6.43	5.32	6.33	5.49	6.8	6.6	5.34	12 " ○ Full Moon 10 58
9 ...	5.6	6.44	5.32	6.32	5.50	6.7	6.7	5.33	19 " ☾ Last Quarter 4 23
10 ...	5.7	6.44	5.33	6.31	5.51	6.7	6.7	5.33	27 " ● New Moon 8 20
11 ...	5.7	6.44	5.33	6.31	5.51	6.6	6.7	5.32	
12 ...	5.8	6.44	5.33	6.31	5.52	6.5	6.7	5.31	
13 ...	5.9	6.44	5.34	6.30	5.52	6.4	6.8	5.30	7 Mar.) First Quarter 5 14
14 ...	5.10	6.44	5.34	6.30	5.53	6.3	6.9	5.29	13 " ○ Full Moon 10 13
15 ...	5.11	6.43	5.35	6.29	5.53	6.1	6.9	5.27	21 " ☾ Last Quarter 0 8
16 ...	5.11	6.43	5.36	6.28	5.54	6.1	6.9	5.27	29 " ● New Moon 11 26
17 ...	5.11	6.43	5.37	6.27	5.55	6.0	6.9	5.27	
18 ...	5.13	6.43	5.39	6.26	5.55	5.58	6.10	5.26	5 Apr.) First Quarter 11 51
19 ...	5.13	6.43	5.40	6.25	5.55	5.57	6.10	5.25	12 " ○ Full Moon 10 18
20 ...	5.14	6.43	5.41	6.23	5.56	5.56	6.10	5.24	20 " ☾ Last Quarter 7 30
21 ...	5.15	6.43	5.41	6.23	5.57	5.55	6.10	5.23	27 " ● New Moon 11 31
22 ...	5.16	6.42	5.41	6.22	5.57	5.53	6.11	5.22	
23 ...	5.18	6.42	5.42	6.22	5.58	5.53	6.12	5.21	
24 ...	5.18	6.42	5.42	6.22	5.58	5.52	6.12	5.20	
25 ...	5.19	6.41	5.42	6.20	5.58	5.50	6.13	5.19	
26 ...	5.19	6.41	5.42	6.20	5.58	5.49	6.13	5.18	
27 ...	5.20	6.41	5.43	6.19	5.59	5.48	6.14	5.17	
28 ...	5.21	6.41	5.44	6.18	6.0	5.48	6.15	5.16	
29 ...	5.22	6.40	...	...	6.0	5.46	6.16	5.15	
30 ...	5.23	6.39	...	...	6.1	5.45	6.17	5.15	
31 ...	5.23	6.39	...	...	6.1	5.45	...	...

The Markets.

TOP PRICES FOR FRUIT—ROMA-STREET MARKETS.

Article.	FEBRUARY.		
	Top Prices.		
Apples, Eating	10s.		
Apples, Cooking	8s.		
Apples, American, Eating ... ..	...	
Apples, American, Green ... ..	...	
Lemons, Italian, per 360	22s.		
Lemons, Italian, per 180	12s.		
Lemons, American, per 180 ... ..	...	
Lemons, New South Wales ... ..	...	
Oranges, Italian	10s.		
Oranges, Local (indifferent)	2s. 6d.		
Mandarins, Local (indifferent) ... ..	...	
Apricots, New South Wales, boxes (half-gincase) ... ..	...	
Apricots, Queensland, half-case ... ..	...	
Plums, half-gincase	6s.		
Peaches, half-gincase	6s.		
Nectarines, half-gincase	4s.		
Gooseberries, English ... ..	...	
Cherries ... ..	...	
Passion Fruit, quarter-case	3s.		
Mangoes	8s. 6d.		
Pineapples, rough	3s. 9d.		
Pineapples, Queen	6s.		
Melons	7s. 6d.		
Rockmelons	3s. 6d.		
Bananas, per bunch	1s. 6d.		
Bananas, per dozen	2½d.		
Grapes (Local) Black, per lb.	8d.		
Grapes (Local) White, per lb.	6d.		
Grapes (South Australian), case of about 30 lb.	11s.		
Custard Apples, per ¼-case	5s.		
Quinces, per gincase	6s. 6d.		

AVERAGE TOP PRICES FOR FEBRUARY.

Article.	FEBRUARY.		
	Top Prices.		
	£	s.	d.
Bacon lb.	0	1	0
Bran ton	7	7	0
Butter, First lb.	0	1	0½
Butter, Second "	0	0	10
Chaff, Mixed ton	5	15	0
Chaff, Oaten "	6	10	0
Chaff, Lucerne "	5	16	0
Chaff, Wheaten "	5	10	0
Cheese lb.	0	0	7½
Flour ton	13	0	0

AVERAGE TOP PRICES FOR FEBRUARY—*continued.*

Article.							FEBRUARY.		
							Top Prices.		
							£	s.	d.
Hay, Oaten	...	...	...	...	...	ton	5	10	0
Hay, Lucerne	...	...	...	...	...	"	4	14	0
Honey	...	...	...	...	...	lb.	0	0	2 $\frac{1}{5}$
Rice, Japan (Duty paid)	...	...	...	...	...	ton	22	10	0
Maize	...	...	...	...	...	bush.	0	5	0 $\frac{1}{2}$
Oats	...	...	...	...	...	"	0	4	2 $\frac{1}{2}$
Pollard	...	...	...	...	...	ton	9	6	0
Potatoes	...	...	...	...	...	"	7	1	0
Potatoes, Sweet	...	...	...	...	...	"	3	17	6
Pumpkins	...	...	...	...	...	"	4	1	0
Sugar, White	...	...	...	...	...	"	21	10	0
Sugar, Yellow	...	...	...	...	...	"	17	0	0
Sugar, Ration	...	...	...	...	...	"	13	10	0
Wheat	...	...	...	...	...	bush.	0	6	8 $\frac{1}{2}$
Onions	...	...	...	...	...	cwt.	0	5	11
Hams	...	...	...	...	...	lb.	0	1	0 $\frac{1}{5}$
Eggs	...	...	...	...	...	doz.	0	1	2 $\frac{1}{2}$
Fowls	...	...	...	...	...	pair	0	4	10 $\frac{1}{5}$
Geese	...	...	...	...	...	"	0	6	1
Ducks, English	...	...	...	...	...	"	0	4	11 $\frac{1}{5}$
Ducks, Muscovy	...	...	...	...	...	"	0	5	6
Turkeys, Hens	...	...	...	...	...	"	0	7	4
Turkeys, Gobblers	...	...	...	...	...	"	0	18	0

ENOGGERA SALES.

(No returns to hand.)

Orchard Notes for April.

By ALBERT H. BENSON.

The Orchard Notes for March dealt largely with citrus fruits, especial attention being drawn to the importance of taking every precaution, now that the fruit is reaching maturity, for preventing its destruction by the various pests that attack the ripening fruit. At the same time, I pointed out the necessity for the proper handling, sweating, and packing of the fruits, in order that it shall be placed on the markets either of this or the other Australian States in the most attractive manner and best possible condition. All that I stated in last month's Notes applies with equal force to the present month, and in fact as long as the citrus season continues, so that I need not repeat what I then wrote, but will simply draw the attention of all citrus-growers to the importance of my remarks, as it is useless to take every care throughout the year to keep the trees well pruned and free from disease and the orchard in a high state of cultivation if we do not do our best to protect the result of such work and to market it to the best advantage.

With the exception of the marketing of citrus and a few other fruits—such as persimmons, pines, bananas, custard apples, &c.—April is a somewhat slack time for fruit-growers, especially those who depend on deciduous fruits, so that the opportunity should be taken to clean up the orchard before winter, and to finish up any odd jobs that have been neglected during the previous months. Such work will consist of looking after all fences, drains, headlands, &c.; the casting back of soil round trees where same has been washed away by the heavy summer rains; the ploughing in of all weeds and trash that have accumulated in the orchard during the wet season; the removal of all dead or worthless varieties of trees that it is desirable to get rid of; and any other work—such as the collection of material for and making of compost heaps—that may be necessary.

Cyaniding for all kinds of scale insects may be continued during the month, taking care not to treat any trees bearing fruit when same is either wet with rain or heavy dew, as, if treated under these conditions, the fruit is apt to be marked.

Strawberry-planting can be continued during the month, but the planting of all kinds of fruit trees should be delayed till the wood has been thoroughly matured. Keep the nursery clean, see that all young buds are growing properly, and that all unnecessary shoots are removed; the young tree being trained to one straight stem till high enough to form the future head of tree, when it should be topped.

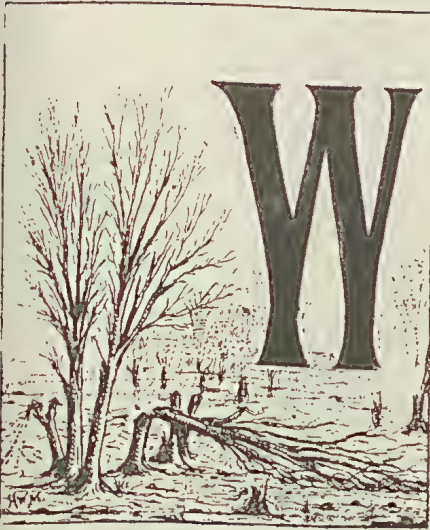
Farm and Garden Notes for May.

Field.—The principal work in the field this month will be the sowing of wheat, barley, oats, rye, and vetches. If sowings have not been already made, there is no time to lose. See that all potatoes are hilled up. Cut tobacco. Those who have cotton growing should be picking the last of the crop. Strip the bushes daily after the dew has evaporated, and spread out the cotton to thoroughly dry in the sun before bagging. Prepare for the winter feeding of stock by utilising all kinds of greenstuff either in the silo or in the stack. Every agriculturist who has a dairy herd should aim at laying down permanent grasses suitable to the climate and to the district in which he lives. A few acres of artificial grass will support a surprisingly large number of cattle in proportion to acreage. A farmer at Barcardine fattens twelve sheep to the acre on couch grass. Coffee-picking should now be in full swing. The berries should be pulped as they are picked. Strawberries now may be transplanted. Trollope's Victoria, Marguerite, Hautbois, Aurie, and Pink's Prolific are good varieties. The Aurie is the earliest, and the Marguerite next. In some localities strawberry-planting is finished in March, and the plants begin to bear the first week in August.

Kitchen Garden.—Onions which have been grown in seed beds may now be transplanted. The ground should have been thoroughly cleaned, pulverised, and rolled beforehand. Onions may still be sown in the open on thoroughly clean ground. In favourable weather plant out cabbages, cauliflowers, lettuce, leeks, beetroot, &c. Sowings may also be made of all these in addition to peas, broad beans, kohl rabi, radishes, spinach, turnips, parsnips, and carrots. Dig and prepare beds for asparagus. Choose the best soil, which is a deep, sandy loam, dug 18 inches deep, and well manured, a good sprinkling of salt may be added a month before the planting season. Then peg out the beds 4 feet wide, leaving a path 2 feet wide on each side of the bed. Plant four rows in each bed, the front rows 9 inches from the side; cover the crowns at least 3 inches with good, loose soil and manure mixed; rake to a smooth surface. The plants must be 15 inches apart. For old beds, cut the stalks down in May; dig the beds lightly over with a fork, and lay over them a good dressing of manure. In September you may begin to cut. You may ensure the blanching of the tender shoots by placing earthen pipes or bamboo joints over them.

Flower Garden.—During showery weather planting and transplanting may be done at once, as the plants will be established before the frosts set in. Camellias and gardenias may be safely transplanted, also such soft-wooded plants as verbenas, petunias, penstemons, &c. Cut back and prune all trees and shrubs ready for digging. Dahlia roots should be taken up and placed in a shady place out of doors. Plant bulbs, such as anemones, ranunculus, snow-flakes, freesias, ixias, iris, narcissus, &c. Tulips and hyacinths may be tried, but success in this climate is very doubtful. All shades and screens may now be removed to enable the plants to get the full benefit of the air. Fork in the mulching, and keep the walks free from weeds. Clip hedges and edgings.

Agriculture.



IN THE SOUTH-WESTERN COUNTRY.

BY THE EDITOR.

HEN Burke and Wills reached the Warrego River they found grass, water, timber, and saltbush growing profusely, and all the country between Lake Eyre, in South Australia, and the Bulloo, Paroo, and Warrego Rivers, in Queensland, has since their time been taken up by squatters, who have raised thousands of fine cattle and sheep, and sent away vast quantities of wool from what in good seasons may be described as the finest agricultural and grazing country in the West. During the past few years, not only Central Australia, but many parts of Queensland and New South Wales, from the Western borders to the coast, have been subjected to a most severe

drought. In March, 1903, I travelled as far as Thargomindah, a township about 750 miles west of Brisbane (670 as the crow flies) to see for myself the state of the country after the drought. The journey from Brisbane to Cunnamulla (604 miles) is now comfortably performed by train, and thence to Thargomindah, a distance of 140 miles, the journey is completed by coach. (Fig 1.)

THARGOMINDAH (Fig. 2.)

is a neat little township on the Bulloo River, in the centre of what has usually been a good grazing district, until the terrible drought which held sway for four years and more in the West, left the whole country west of the Main Range in a very bad condition, despite the numerous splendid artesian bores which have been put down in all directions, and which yield a continuous flow of clear water of from 2,000,000 to 7,000,000 gallons daily. The population of the town is about 400. The whole surrounding country at the time of my visit was dreary and desolate, scarcely a vestige of anything green except about the banks of the river. Prior to the late rains dust storms were of common occurrence. One of these enveloped the coach as we travelled along and completely hid the horses from view. (Fig. 13.) Another we escaped through the driver pushing his team to get ahead of it before it reached the road. He just managed it. These whirlwinds travel at great speed and carry vast quantities of sand to a great height into the air, to be afterwards caught by a westerly current above and driven towards the coast. There is a very fine artesian bore about half-a-mile outside the town. (Fig. 3.) Mr. H. W. Mobsby, artist to the Agricultural Department, took a photograph of it, although it was rather late in the afternoon. This bore is 2,580 feet deep, and yields 1,000,000 gallons per day. The water pressure reaches 230 lb. per square inch, and advantage is taken of this to drive a dynamo and illuminate the town by electricity. The streets are reticulated, and hot and cold water baths may be had at the hotels and private houses at any time. There are two very good hotels and some shops and other buildings facing a large square. All the streets are planted with fine pepper trees. There is nothing done, I was told, in the way of agriculture in the neighbourhood, but wherever a garden has been made, fruit, flowers, vegetables, and millets of various kinds thrive well. For

many miles round the town the country consists of stony flats, destitute of water. We were very hospitably entertained by the resident medical man, Dr. Newbury-Brown, and several other residents, and we would gladly have accepted several invitations we received to visit in the district had it not been that we were assured that, however pleased the residents would be to drive us round, yet we should see nothing but the dreary monotonous country of everlasting dead cypress, boree, mulga, and gidyah, and the evergreen coolibah. (Fig. 4.)

Accordingly I decided that it would be more in accordance with the intentions of the Department if I were to leave Thargomindah next day rather than spend six days in practically doing nothing. These days could be spent to better advantage in Cunnamulla, where, I understood, many of the grazing farmers were entering rather extensively into agriculture by irrigation, and an inquiry into this work was the object of the journey; so we bid farewell to our hospitable entertainers and left at 6 a.m. next morning for Cunnamulla. (Fig. 6.) As the coach crossed the Bulloo on a narrow rough stone dam (Fig. 7), I noticed that there was a good strong stream of water running through the stones and under the dam. As we bowled along after leaving the river there was a fair amount of grass springing and the coolibah trees looked very green and refreshing, but evidences of the drought existed everywhere in the shape of dead cattle and horses, one bullock in particular (Fig. 19) lying alongside the road attracted our attention. At the first glance he looked to be calmly sleeping. A closer inspection revealed the fact that he was merely one of the "have beens"—a dried mummy. A railway line from Cunnamulla to Thargomindah has been surveyed and the pegs are seen all the way. Eight miles out from the town is the selection of Mr. W. Thompson. (Fig. 5.) He has weathered the drought by growing feed for his stock by means of a never-failing well of good water. He owns some 500 head of sheep, 200 cattle, and a number of well-bred mares, whose foals were seen in the stockyard in considerable numbers. Mr. Thompson extended the usual bush hospitality to us, and the refreshing cup of tea was most grateful, seeing that the thermometer showed 113 degrees in the shade. I have travelled a great deal in Queensland, in the far North and West, but I never experienced such terrible heat—dry, fortunately—as during the last 20 miles of the drive from Thargomindah.*

After leaving Mr. Thompson's place, the country is in a very bad state as far as the boundary fence of Dinevor Station, where good grass country begins. One side of the road is fairly grassed, but the other side is a howling wilderness of dead trees, stone, and sand. After this, miles of absolutely desert country, all the mulga and other trees being quite dead. In the midst of this awful desert there is a well, called the 18-Mile Well, with a windmill. (Fig. 9.) This well was sunk by the Divisional Board to a depth of about 40 feet, and there is plenty of water in it. It used to be a changing place for Cobb's coaches, but the grass failed, and it had to be given up. Four miles further on there is good tall grass and a few living mulga trees. (Fig. 10.) Now some low ranges come into view, which are precipitous in places, and at one point, called the Gap (Fig. 18), several caves are visible on the face of the precipices. The country passed over is all stone and gravel. In places it would seem as if some Titanic roadmakers had been laying down millions of tons of broken metal. There is not a blade of grass, and the trees are all dead. (Fig. 8.) Now we come to what was once a hotel called the "Rising Sun." (Fig. 14.) No liquid refreshments are now dispensed here. We changed horses, and then entered upon 10 miles of most dismal country—the region of the Dinevor Lakes. The principal lake is a vast sheet of shallow, muddy, yellow water, very brackish.

The coach track runs over 10 miles of pure white sand raised into innumerable hillocks about 2 feet high, crowned with stunted shrubs, over which the horses have heavy work to drag the vehicle. (Fig. 11.) Then the track runs along the shores of the lake for a mile or so on hard sand. (Fig. 12.) There is

* Rain set in at Thargomindah on the 30th March, and heavy rain fell at Charleville on the same date. There is now every prospect of good seasons in the West.

QUEENSLAND

WESTERN

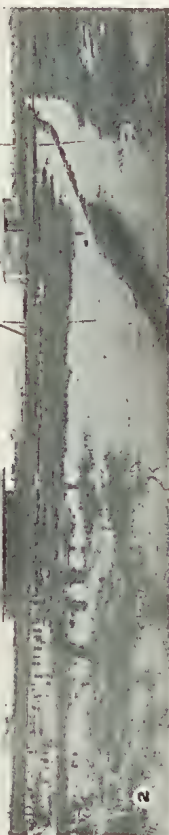
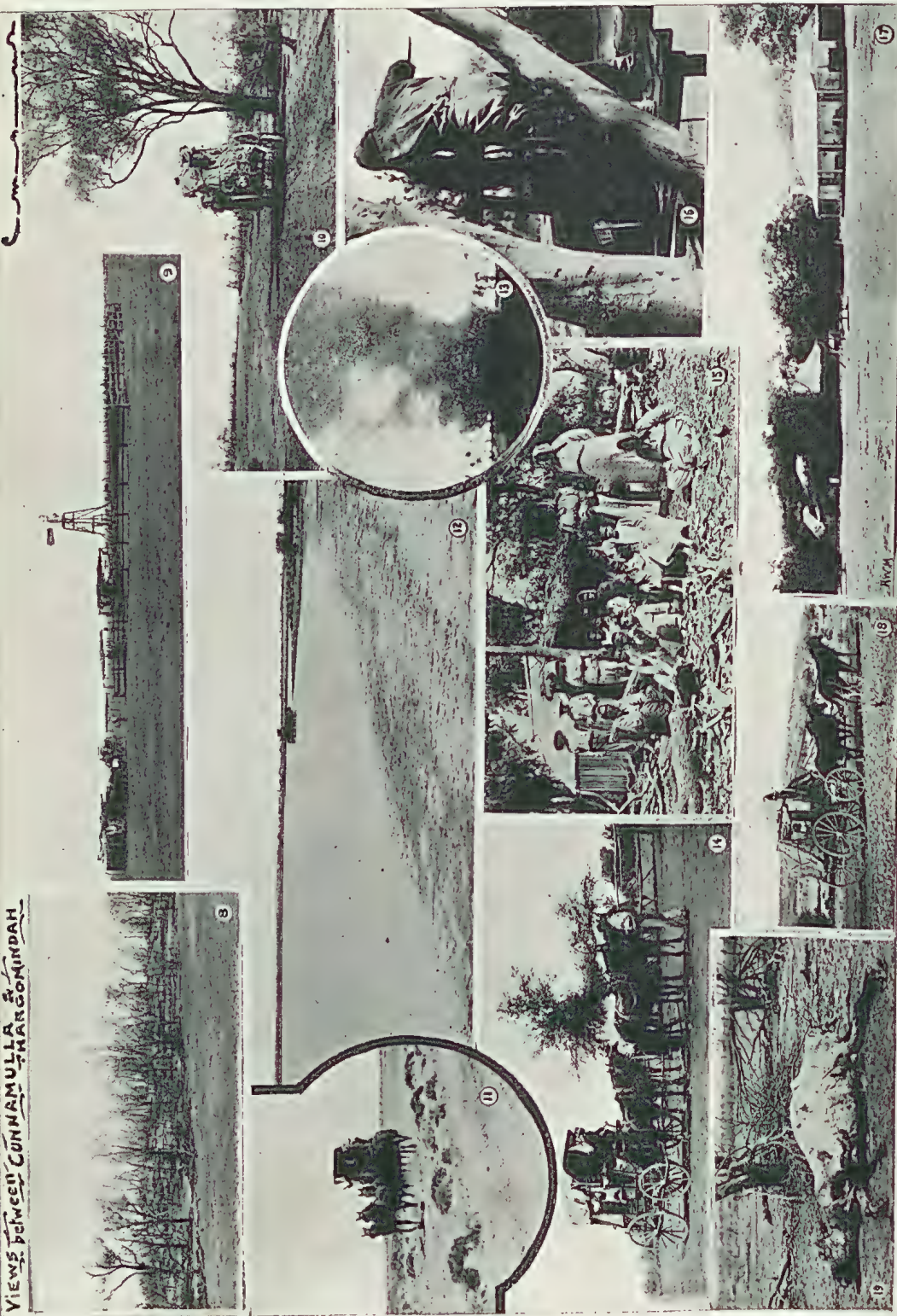


Plate XXIII.

VIEWS FROM CUNNAMULLA MARGONDAH



IN THE DESERT COUNTRY.

plenty of saltbush here, and the horses drank the brackish water readily. The traveller here might imagine himself transported to the main beach at Southport, so far as the sand and foreshore are concerned. There is absolutely no grass on the stock route from here to within 2 miles of Dinevor Station. Then the good grass begins. There is also some very good timber. Arrived at Dinevor, we were invited to have a meal in the men's quarters, and the Chinese cook gave us a very excellent dinner.

A large number of native blacks are kept on the station, and they appeared to be a very happy family. (Fig. 15.) They were well dressed, both men, women, and children; some of the women were enormously fat. All were very good tempered, and the overseer ranged them all up outside their quarters to enable Mr. Mobsby to take a snapshot of them. The oldest man was turning the wheel of a chain pump, and a back view of him was obtained (Fig. 16), also a general view of the station. (Fig. 17.) The buildings are very good, and fruit trees and a garden are watered from a large waterhole behind the house; 4 acres were in preparation for sowing wheat. This is the best looking country we have passed through. The land is ideal agricultural soil, as, indeed, is most of what we saw between Thargomindah and this place, except, of course, the very stony flats and ridges. All that is wanted to make this part of Queensland a great agricultural district is rain, and failing rain, plenty of bores and an intelligent use of the bore water. From what I saw of the use made of bore water—in some cases the misuse of it—it struck me that a visit by Dr. Maxwell to the district, or by the selectors to Barcaldine would open their eyes to the possibilities of the land to an extent so far undreamt of by them. There was one bore I saw, the water from which—some 5,000,000 gallons—was wandering away along a few miles of ditches, for no earthly purpose but to water stock, whose numbers have been sadly diminished owing to want of grass during the late drought. That there are more sheep and cattle in the West than is generally thought is, however, an undoubted fact. The whole of the flocks and herds have not died out by any means, and if a tally could be taken of the number of sheep in the various districts of the State it would probably be found that instead of 10,000,000 there are half as many again. There are many places where there is good grass, and where grass, although dry, has kept the flocks going. In proof of this, a mob of cattle, just arrived in New South Wales from a three months' journey through Western Queensland, has arrived in grand condition, although the drought was then at its culminating point.

Whilst I am on this question of bores, I will take the opportunity of pointing out what must eventually be the result of the constant running of millions of gallons of water over the country. Vegetation springs up on the banks of the ditches. There is heavy evaporation. Where evaporation occurs, condensation must naturally follow, not necessarily near the original source of the water, but perhaps a hundred or more miles away. Condensation means rain or heavy dews, and these mean grass in abundance. There are now something like 500 bores at work pouring forth almost a billion of gallons of water every 24 hours. This water is carried over miles of country in ditches. The evaporation must be very great. As bores increase, and a greater area of water is exposed to sun and wind, the climate must be influenced by the evaporation, and eventually the arid and semi-arid districts will change their nature and will benefit by an increased rainfall. Take the instance of Mr. Hannay's bores at Geera, near Barcaldine. As related in this *Journal* a little while ago, he has created several lakes on his property, the largest covering 40 acres. These lakes have so changed the climate that an arid, dry, atmosphere has been converted into a moist one. Supposing that hundreds of settlers in the West did the same thing, the result must inevitably be what scientific men predict in the event of a great canal scheme in South Australia being carried out to form an inland sea. The enormous evaporation from such a sea would be productive of a moist atmosphere, heavy condensation and consequent regular rains. This idea is not chimerical, but is based on scientific data.

After leaving the head station some bad patches of stony flats occur for about 3 miles with no water; but, with these exceptions, it may be said that there is a fair amount of feed right away from the boundary fence of Dinevor to Bingara, but some of the land is dry and stony before reaching the fence. All along the rabbit fence for scores of miles there was no sign of rabbits. Where there used to be thousands only an occasional few are seen; but I was told that once the grass grew the rabbits would increase and multiply, and be as much in evidence as ever. After passing through the eastern boundary fence of the station the good land begins again, and on Mr. Jones's selection there is plenty of good grass.

Bingara, the next changing station, 75 miles from Thargomindah, where we camp for the night, is the old head station. (Fig. 24.) The buildings are now only occupied by a married couple. The husband is groom for Cobb and Co. There is a fair amount of grass. The coach horses are not corn fed, yet their splendid condition shows that there must be capital grass in the paddocks where they run.

The groom's wife, Mrs. Watson, keeps the accommodation house for the travellers by coach, and the place is as comfortable as can be expected in such a desolate, uninhabited region.

The weather being exceedingly hot we all camped out in the open in preference to sleeping indoors.

At 3 a.m. next morning breakfast was announced, and by 4 a.m. we were once more on the road, in the dark, but we had a capital driver, who knew every inch of the road, and by daylight we were well on the road to Eulo. More wretched, drought-stricken, desolate country as far as Yowah Creek, 12 miles west of Eulo. Here there are numbers of mud springs, some active, some extinct, some in groups, others isolated. (Figs. 20, 22, 38.) Nearly all had thrown up vast mounds of clay, which had hardened in the sun. Grass, rushes, and saltbush grew in great profusion in their neighbourhood. On one occasion a spring had burst out in the coach track, and the driver, unaware of the new development, drove the horses into it. The latter were got out, but it was 24 hours before the coach could be extricated.

Close to these springs is a very good selection belonging to Mr. Robt. Gardiner. He has a large number of goats, and lambs and calves reared by the nannies. (Fig. 27.) The grass is very good here.

EULO

was reached at 8.30 a.m. This little town is prettily situated on some rising ground on the banks of the Paroo River. (Fig. 23.) In flood time the coach has to be taken over in a small iron punt just large enough to hold it. This punt has no movable lips. The coach has, therefore, to be hove up on planks to the steep bank, an operation which often takes the labour of six men for five hours. Happily there was little water over the crossing place, and we got over easily. (Fig. 21.)

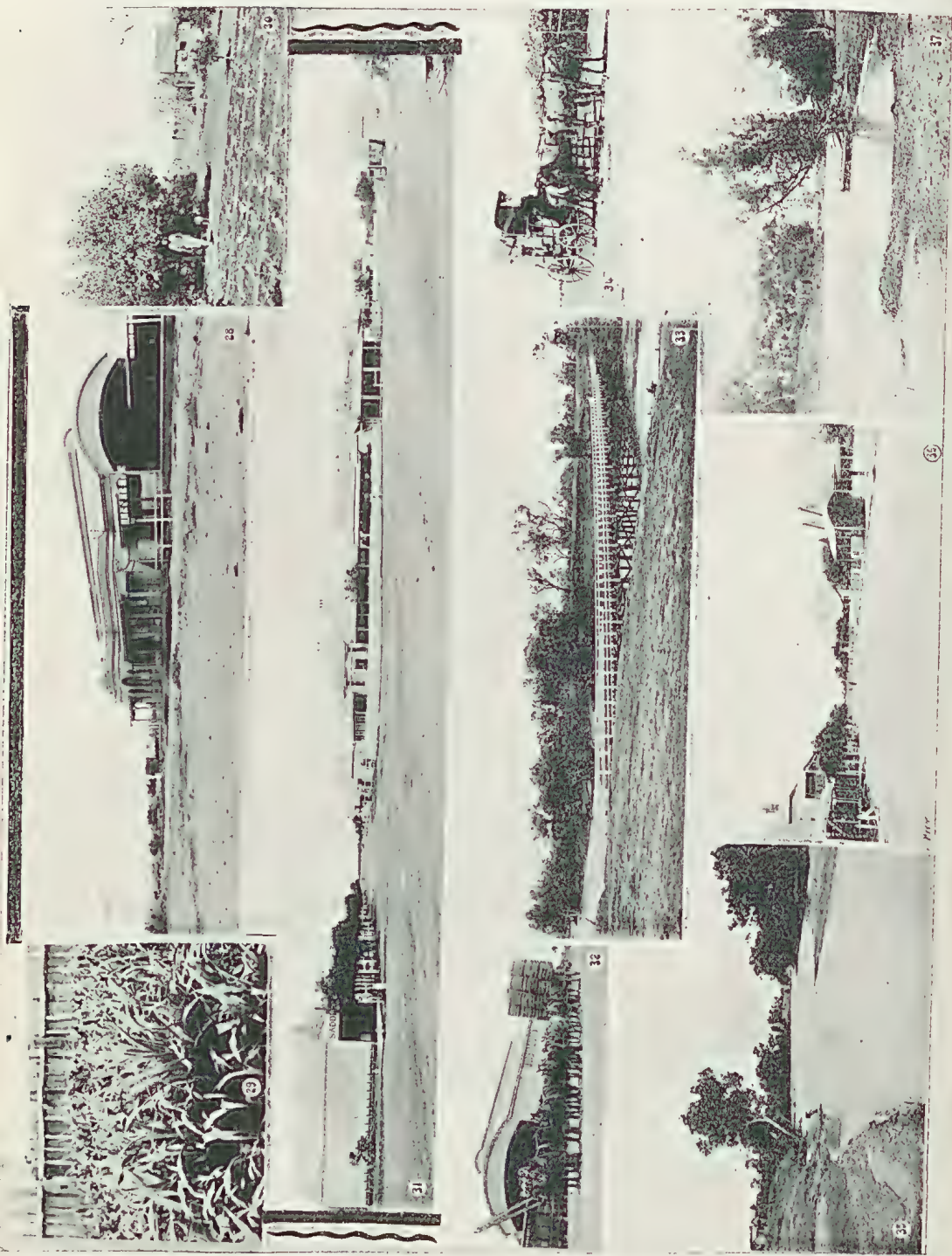
There is a very good hotel here with a pretentious brick annexe for the boarders. This is the Gladstone Hotel, kept by Mrs. Hickling. Everything here is good and comfortable, yet we are 50 miles from a railway, with a train only twice a week. We spent a couple of hours here owing to two of the coach horses having bolted. The driver recovered them both, one having galloped 9 miles with the harness on. No harm was done, and we got on the road in fairly good time. Dry country for the next 25 miles to Moonjarie, the next changing station. (Fig. 25.) Twenty miles from Eulo is Waiora Station. Some cultivation is done in the neighbourhood of Eulo by the selectors, notably by Mr. W. Carrols, of Curragha, who irrigates for grass. There is some good country watered by a bore close to the Eulo road, but no cultivation. Most of the selectors here have no bores, but one is being put down now by Mr. Young, at Glenara.

The country about Moonjarie is as bad as anything we have seen since leaving Bingara. We got a most meagre meal here, which myriads of flies disputed with us. We were told that the mutton was the remains of the last sheep



VIEWS ON THE ROAD BETWEEN THARGOMINDAH AND CUNNAMULLA.

Plate XXV.



CUNNAMULLA AND THE PAROO RIVER.

left alive on the station, but we took this as a joke. The mutton, however, was no joke.

At 2.40 p.m. we were clear of these regions of sand and flies, and now only 25 miles lay between us and Cunnamulla. The country continued to look drought-stricken till we came to a regular oasis in the desert—Kahmoo, 12 miles from Cunnamulla. Here there are wool-scouring buildings and a bore. (Fig. 26.) The bore water crosses the road and runs for several miles in trenches into grass paddocks. A little irrigation is done but not much.

Cunnamulla was reached at 6 p.m. after a dreary and monotonous ride of 140 miles, only made bearable by the urbanity and good nature of the driver, Stephen Wall, who did all he could to assist Mr. Mobsby in getting photographs of interesting points, and who gave me much information about the country passed through.

CUNNAMULLA

is a very pretty, well laid-out township on the Warrego River, 560 miles west of Brisbane (604 miles by train). (Fig. 31.) Like Thargomindah, it is the centre of a rich grazing district, and has a population of about 800. It is a relief, after the lamentable country we have passed through, to see the streets lined with bright green trees (Fig. 36), to see the gardens, and to mix with people who do not groan and grumble at the calamity which has overtaken the district in the shape of drought. There are some very good hotels in the town, notably the Club and Tattersall's. We put up at the latter, as Mr. Birdsall, the proprietor, promised to drive us round the country to visit several selections. As we had five or six days to wait for the next train to Charleville, we concluded that we should have a good time in fulfilling our mission here. Unfortunately the selectors were averse to our visiting their properties, only one inviting us to call at his place. There is a considerable amount of cultivation carried on in the neighbourhood of the town, which it would have been interesting to inspect. Still, when a man objects to your proposed visit, on whatever ground, it would be obviously bad taste to insist.

Owing to the mail train only running once a week we were delayed for six days, during which time the townspeople did all they could to make our stay pleasant and profitable. It is owing to their kindness that I am able to give some idea of the doings of squatters and selectors in the district.

The Warrego, just below the town, consists of a stretch of water 4 miles long. (Figs. 35, 37, 39.) Across this there is a fine bridge, 360 feet long, intended for the railway bridge—when the extension to Thargomindah is accomplished. (Fig. 33.) There is a fair amount of grass in the neighbourhood, and stock are looking well. The bores about here are sunk to various depths. Some are 2,000, some 1,500 feet deep. The flow runs from 3,000,000 to 4,000,000 gallons daily, the water having a temperature of about 118 degrees Fahr. The water contains a great deal of mineral matter, but if left to subside and cool it loses most of its deleterious qualities and becomes quite fit for drinking and for all other purposes. Some say that it ruins the grass, and that after two years it kills everything it touches. One man told me that he sent his bore water over miles of country, and wherever it overflowed or burst through the ditch, it killed all the Mitchell grass and weeds came up instead. On the other hand, another man told me that wherever he watered the Mitchell grass it was like a waving wheat field. I saw several patches of Johnstone grass, sorghum, pearl millet, amber cane, and lucerne which were growing beautifully by the application of bore water. (Fig. 29.) Some of these plots had been watered for over 4 years, and were still growing well. Pumpkins, melons, cucumbers, and many kinds of vegetables were plentiful in private gardens, as well as at the Chinamen's gardens. In Ah Fong's garden (Fig. 30), there were splendid grapes, the vines, which were from 8 to 10 years old, looking healthy and strong. The principal varieties grown are the white and black muscatels. The whole of this country appears to be admirably adapted for viticulture and

the cultivation of citrus fruits. Stone fruit will, however, not stand the bore water. Some fine apricot and peach trees, which had been growing and bearing heavy crops for years without the bore water, all died soon after its application. The citrus trees thrive on it and bear well. The bore water is laid on to all the houses, and, as at Thargomindah, hot and cold baths can be had anywhere, and public baths have been built at the bore. The water power is utilised to drive punkahs in the hotels, but there is no electric light in the town.

We drove out one day about 12 miles down the river, and although there is plenty of water, we only saw two homesteads on its banks, those of Mr. Dick and Mr. Ewart, secretary to the Divisional Board. (Fig. 45.) Mr. Dick (Fig. 44), grows a considerable amount of green fodder, which sells readily in the town at a very good price. He irrigates his land with the river water, raised by an engine to a tank raised on piles, whence the water passes down to the cultivation ground. (Fig. 40). The engine also drives a saw used for cutting firewood. Mr. Ewart used to grow large numbers of fruit trees, also irrigated with river water. When the drought came the river near his place dried up. He sank a well, and kept on irrigating until the increasing depth of the well placed the raising of water beyond the power of his pumping gear, so in despair he gave up and most of the trees died. Messrs. Cobb and Co. have a large wool scouring and sheep shearing establishment out here. (Figs. 42, 43.) Some irrigation is done, but the main business of the firm is connected with the wool industry. The place is under the care of Mr. Ford, who has all in readiness for shearing a large number of sheep. I am greatly indebted to Mr. Cronin, secretary of the School of Arts, and to Mr. Drew, of Messrs. E. Rich and Co., who have a very large establishment in the town; also to Mr. Birdsall and others for the trouble they took to further our views and furnish us with reliable information as to the state of the country, condition of stock, irrigation, agriculture, and grazing.

The day before we left, Mr. Mobsby got some excellent photographs of loaded wool teams coming into the railway yard. (Fig. 28.) Some of these had 70 bales on each waggon. (Fig. 32.) At the railway station the stationmaster, Mr. Donnelly, has made a very pretty garden full of roses and other flowers, creepers, fruit trees, and vegetables. His roses were very much in request on St. Patrick's night, when a grand ball was given in honour of the day.

We left Cunnamulla on Tuesday morning for Charleville, but before describing the country between the two places it will be of some interest, perhaps, to the dwellers in those parts if I suggest a means of heightening the prosperity of the district by increasing the population and adding agriculture on a large scale to its present industries.

THE WARREGO AND ITS POSSIBILITIES.

I have already pointed out that there are very extensive tracts of excellent agricultural land all the way from Dalby to Thargomindah. There is exceptionally good land on the Warrego, admirably adapted to wheat-growing, and indeed to the cultivation of all cereals and root crops. There are thousands of acres of such land, and if only a regular rainfall could be depended upon, I believe that astonishing crops of wheat and oaten and wheaten hay could be produced here. I know that 40 bushels of wheat and 4 tons of oaten hay per acre have been obtained by several growers who have irrigated their crops. If two or three men can do this, why not two or three hundred? Why not two or three thousand? Where are the wheat-growers of the future to get land? Although there are large areas of rich land open to selection on the Darling Downs, there is no longer any very cheap land there—that is, land cheap enough to grow wheat on. The wheat farmer, then, must have cheap land if wheat-growing is to pay him a good profit. To get such land, he must go west, whether it be west of Rockhampton or west of Brisbane. Already the pioneers of the industry are at work on the Central-Western lands. Wheat-growing may be almost looked upon as an established industry there. The pioneers are also out in the south-west, beyond Roma, and even beyond Charleville, out on the

Views near
CUNNAMULLA.



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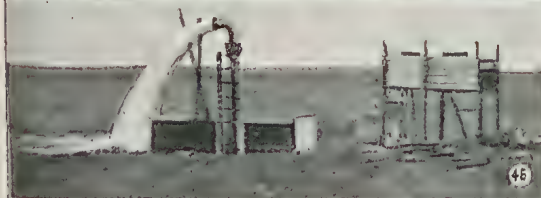
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Warrego. Thirty miles from Cunnamulla is Longlands, the property of an enterprising man, Mr. O'Connor, who has practically shown that splendid milling wheat can be produced, in time of drought even, by irrigation. I am almost inclined to the belief that irrigation can be conducted as cheaply on the Warrego as on the country between the Belyando, Barcoo, and Thomson Rivers. The Warrego bores, and those in the country beyond, are certainly more costly to put down, but they yield such vast volumes of water, that much greater tracts of land can be irrigated by them than by those, say, at Barcaldine, where the yield rarely reaches 700,000 gallons per day. Where, in one case, 500 acres can be irrigated by one bore, in the other, only 50 acres can be dealt with per bore, and the work connected with the distribution is, comparatively to area, just as expensive or inexpensive in the two cases. I shall show directly what can be done on the Warrego by intelligent agriculturists, and by a scientific application of water to the land. But, independently of the bores, there is an opportunity presented on the Warrego for the storage of vast quantities of water, which would amply suffice for the needs of hundreds of wheat-growers, if only some very wealthy speculator could be induced to take up the scheme. It is this. The course of the Warrego from its sources in the deep gorges of the main dividing range beyond Augathella to a point about 8 or 10 miles below Cunnamulla (Figs. 39, 45), is about 350 miles, and throughout the whole of this distance there is everywhere as fine soil for wheat-growing as the most fastidious farmer could wish to put the plough into. Even after the most terrible drought which has ever been recorded since Sturt's time, there are splendid reaches of deep water at short intervals all along the river's course. As for the river in flood time, it is in reality a grand river throughout. Now, can anything be done to store this water, which now practically goes to waste? Yes, and at an outlay, small indeed in comparison with the benefits to be derived from the work both by the State lessee and by the State itself. A sum of from £60,000 to £70,000 would erect headworks among the deep valleys at the sources of the river. Then about 10 overshot dams would be needed. These would cost about £3,000 each. The expenditure of £100,000 would retain all the vast volume of water which now goes to waste every year.

It is worthy of note that no single year has gone by without one or more freshes occurring in the river, even during the drought. Hence farmers need be under no apprehension of ever being short of water for irrigation purposes. Nor need the weather be any source of anxiety to him. The river and the pumping stations would relieve him of all necessity for rain. Undoubtedly, occasional showers are helpful, but the experience in the Central Districts has been that heavy crops can be produced in the driest years without a single shower. And it is not alone the agriculturist who would thrive, but the grazier also, either by growing fodder crops and hand-feeding his sheep, as was done by Mr. Gatenby, at Jemalong Station, in New South Wales, or by merely irrigating certain areas of his grass land. In the Jemalong case, 75 sheep were kept in perfect condition on a single acre of lucerne, or, as in the experiment, 1,680 sheep thrived on 22½ acres of lucerne cut and fed to them. When this can be done, where is the sense in taking up from 10,000 to 20,000 acres of land of which it takes from 5 to 10 acres to feed one sheep? That great experiment of Mr. Gatenby's, carried out afterwards by the New South Wales Department of Agriculture, and which is, therefore, certified to as correct, must convince the most sceptical that, given water conservation, droughts of the future need not be feared. And droughts will occur again and again. Would it not be wise to prepare for them, and would it not be the acme of folly when good rains have come and grass is growing all over the country, to rest content in a fool's paradise, and cry "safe" when there is no safety? With 300 acres of good land under irrigation, 10,000 sheep could be fattened. At Barcaldine, on ordinary couch grass—irrigated—Mr. Cronin fattened from 8 to 10 sheep per acre.

As for the waterholes of the Warrego, they may be seen every few miles. Just below Charleville there is a fine stretch of water. Between that and Dilalah

there are two or three, and several between Murweh and Claverton, and on past Congoola down to and far beyond Cunnamulla. If a 10-foot overshot dam were erected at Kane's Crossing, 4 miles below Cunnamulla, so level is the ground that that single dam would throw the water back for over 30 miles. When that water is dammed back, a sand dredge would easily remove the sand which is now obliterating what at one time must have been a noble deep river. The width of this stream would be about 3 chains, and the depth of water 10 feet. That means that over 1,900,000,000 gallons would be safely retained. With several such dams along the course of the river, and with headworks which would retain 10,000,000,000 gallons, there would be no fear of farmers or graziers ever running short of water for irrigation. I think that, with some such scheme of water conservation for the whole West, Queensland could be made the granary of not only Australasia, but of Great Britain also.

Now, of course, the vital question has to be asked: Will it pay to grow wheat 600 miles from port? I think I answered that question very fully in my report on irrigation and wheat-growing in the Central Districts, so I need not repeat the arguments here. The other questions which the Western man can ask and answer for himself: "How much does the flour cost which is annually consumed on the station, on the grazing farm, or in the household?" "Could I get my flour cheaper if the wheat were grown here in sufficient quantities to keep a small flour-mill going?" "What has it cost me for corn and fodder imported from Sydney to keep my stock alive?" "Could I have done it cheaper if farmers here grew quantities of fodder by irrigation?" The last two questions can be answered by what has actually been done in the Warrego District by a station manager. On that station, enormous sums had to be paid for corn, &c., to keep the sheep alive. Chaff was worth £20 per ton in Charleville. At last a cheap line of chaff came into an agent's hands at one of the Western towns on the Warrego. It was offered to the manager at £10 per ton. He declined, he said, to pay £10 per ton for an inferior article when he could grow much better for £1 per ton. Is not this a good argument in favour of irrigation farming? The farmers could grow the fodder, and the graziers and squatters would take it off their hands at good prices rather than lose 50 per cent. of their flocks and herds, or rather than go to the trouble of cultivating their own land.

It may be interesting to readers of the *Journal*, unacquainted with the Western country, to learn something about

THE STATIONS AROUND CUNNAMULLA.

Burrenbilla.—This station is about 5 miles south of the town, and is owned by Cobb and Co. The manager is Mr. Webster. There are three bores on the property, each over 3,000,000 gallons daily. No cultivation to speak of.

Coongoola.—Situated 30 miles north of Cunnamulla. Owners, Armstrong Bros. Manager, J. J. Armstrong. The homestead is on the Warrego. There is a railway siding, and, as far as I know, only one bore, which is said to yield 7,000,000 gallons per day. It is 1,700 feet deep, and the water is carried for miles over the grass land.

Yarmouth.—30 miles east of Coongoola. Owner, W. Clarke and Co. Manager, G. Farlow. One splendid bore, yielding 4,000,000 gallons. There is no cultivation. The country is principally mulga.

Elviston.—Near Yarmouth. Mr. Rookes is both owner and manager. The bore here also gives 4,000,000 gallons. I do not know whether he cultivates any ground.

Elmina.—About 15 miles from Elviston to the east. Messrs. Fletcher Bros. are the owners, and manage the property themselves. There is a good bore here. The country is mulga. Unknown whether any cultivation is done.

Tinnenburra.—Close to Barrungun, 75 miles from Cunnamulla. This property belongs to the Tyson Estate. Mr. McDonald, manager. The station is well watered by the Warrego and by several bores.

Thurulgoona and Bundaleer.—Owners, the Squatting Investment Co. Manager, Mr. McVean, with a sub-manager at Bundaleer. There are several bores on the property varying in flow. Last year many acres were irrigated for wheaten hay, of which hundreds of tons were produced. Previous to undertaking this cultivation, all fodder for the stock was purchased at enormous expense. Last year the fodder only cost the owners £1 per ton or thereabouts. The hay crop, I am told, averaged 3 tons per acre, and the cost of production was said to be £2 per acre. This year a much larger area will be cultivated. There are several stacks of last year's crop still standing.

Charlotte Plains.—Twenty-five miles from Cunnamulla, on Widgegoara Creek. Owners, estate of McDonald Bros. General travelling manager, Mr. Gorig. Mr. Ivory, resident manager. Splendidly managed property. There are two grand bores here, running over 4,000,000 gallons each, but no cultivation is done. About 45,000 sheep were being shorn in March.

Weelamurra.—Twelve miles south further down the Widgegoara. Owners, estate of G. King. Manager, Mr. E. King, who is chairman of the Paroo Divisional Board. There are two good bores here, at both of which some cultivation is carried on. Fodder grasses are produced, especially Johnston and *Paspalum*, which thrive amazingly.

Avondale and Widgegoara.—Goldsbrough, Mort, and Co., owners. John Bignell, manager. There are two bores, but I heard nothing about any cultivation being done.

Camden Park.—Same owners. J. F. Frazer, manager. There is a splendid bore, but no cultivation to speak of is done. About 15,000 sheep were about to be shifted for want of grass. The late welcome rain has probably obviated the necessity for this. Yet there is a splendid water supply, and the example of Mr. Gatenby, of Forbes. How much cheaper could those 15,000 sheep have been fed here than at Jemalong? No steam to get up, no engineer wanted, no fuel to pay for. All that is wanted is to plough the land, sow the seed, turn the water on in ditches, and Nature does the rest.

Noorama.—Owners, the British Investment Co. C. J. Scott, manager. About 20 miles south of Camden Park. There is a grand bore here, but no cultivation.

GRAZING FARMERS WITH BORES.

Harridan Park.—Mr. Beal's property. There are two bores on this land, and the owner floods his land and lets the grass grow. Other selectors adjoining his property are Mrs. Manus, of Abadoah; Mr. Webb, of the 9-mile; and McLaren Bros., of Red Bank, all holding 10,000-acre blocks of splendid land, which is improving in value every day.

Mr. Phillott's property is about 18 miles from Cunnamulla. There is a good bore on the place, and some cultivation is done. Melons, 56 lb. in weight, are produced here.

Longlands.—Owner, Mr. O'Connor. This gentleman is the pioneer wheat-grower for grain. His bore runs 5,000,000 gallons per day. The wheat grown here was a grand sample, and was produced from seed sown broadcast and scarified into the soil. It is typical wheat land, and being level is admirably adapted for irrigation.

Offham.—Mrs. Palmer has a beautiful selection here. There is a very good bore, and I was told that horses can be seen in the horse paddock up to their knees in grass produced by irrigation. It was a perfect oasis in the desert a few months ago.

Going north along the river are the following selections:—Tracey's, 8,000 acres; Beardmore's (Nulla); Manus (Spring Grove); G. White (Wallen); J. C. H. Schmidt (Goolburra).

South from Cunnamulla are—West Burrenbilla (B. Smith), and Greenbank (H. Albion).

There are no bores on these selections, but the owners would benefit if the river were dammed.

Towards Eulo there is Mr. W. Carroll's selection, Curragha, with a fine bore. He is irrigating for grass, and is very enthusiastic about it. The grass will be cut for hay.

Kahmoo.—R. D. Rankin, manager. It has some splendid country watered by a bore close to the Eulo road. There is no cultivation.

Moonjarie, on Bough Creek, is 25 miles from Cunnamulla. The bore here has a very small flow, but splendid wheaten hay has been grown here by its aid. There are several selections close to Eulo, but none have any bores, although one is being put down at Glenara by Mr. Young, the owner of the property. Eastward, along the Bollon road, are several homesteads, all in the mulga country.

BOWRA.

Opposite Cunnamulla, just on the other side of the splendid waterhole in the river, is the old homestead of Bowra, standing in the midst of about 8,000 acres of land. In 5 or 6 years this land will revert to the Government. It is splendid agricultural land, and close to the town. I suggested a little further back the building of a dam at Kane's Crossing, to back the water up. If that ever comes to pass, this land would be very suitable for close settlement in areas varying from 160 to 640 acres. These might be occupied by teamsters, shearers, and others, who, not being always at work, would find time to make comfortable homes for themselves and their families by cultivating the ground. There will be plenty of young southern farmers coming to Queensland when the effects of the drought are no longer apparent, and if South Australians and Victorians understand anything of farming they know a wheat country when they see it, and, as I have already said, the West is an ideal wheat country—under irrigation. The rainfall cannot be depended on. Seeing what has been accomplished in the way of cultivation by several grazing farmers and squatters, I am at a loss to understand why others with equal facilities view with placid composure the partial or total loss of their stock when the means of saving them are at their hand.

Of what earthly use is it to sink an expensive bore, which will yield 4,000,000 gallons of good water in 24 hours, and run it for miles in a trench through country destitute of grass? Stock cannot live on water alone. But little provision is made for producing grass by a judicious use of the precious water. I saw one bore pouring out millions of gallons into a small dam, whence it ran through the country—grassless country—to expend itself somewhere, and on the whole line of ditch the only living things visible were 5 emus (Fig. 47) and flocks of galah and other parrots.

I will now describe, as well as I can, the country between Cunnamulla and Charleville, a distance of 121 miles. Between these two towns it may be said that every acre of the land consists of good soil suitable for agriculture. Certainly it was generally dry, or else here and there the grass was beginning to spring. The country is timbered with coolibah, cypress pine, mulga, and gidyah, with here and there some leopard trees, so called from the spotted appearance of the bark. At Coongoola a grand bore is seen from the train. (Fig. 46.) I have already noted this bore and its flow of 7,000,000 gallons. At Claverton Downs and Bando the country looks in a bad plight—dried up and no grass.

At Wyandra only 90 points of rain had fallen during the year. There had been a fire here, succeeded by a heavy cyclone, which had scattered the remains of iron in every direction, and carried two tanks right across the railway line to a stockyard, one being blown right over it. (Fig. 65). Thence to Bangalore and Wallal the country looked like a desert, no grass visible anywhere, whatever there might be back on the ridges. (Fig. 41.) The trees were dead all along the line. For many miles the soil is blown away till the red, rocky subsoil is all that remains. As far as Charleville the country is all dry. The impression I got on this trip was that the drought had not by any means broken up between Thargomindah and

Plate XXVII.



IRRIGATION AT CHARLEVILLE



FROM CHARLEVILLE TO CHINCHILLA.

Charleville. Certainly there were patches of grass on the "Wayback," but the stock routes were completely bare of grass. There was not as much as would feed one small mob of travelling sheep. There was not a drop of rain from the time we left Brisbane till we reached Charleville on the return journey. I must except Dinevor from the charge of barrenness. The grass and water were good there, right across from the western to the eastern boundary of the run. After that—desolation. I had intended to stop at Dilalah, on the invitation of Mr. Love, the manager of the station, but the delay at Cunnamulla made it necessary to abandon that intention.

CHARLEVILLE.

At Charleville we put up at McLennan's Hotel, whence we drove out to Mr. Armstrong's, to see what he was doing in the way of cultivation and irrigation. This gentleman has a large butchering and saw-milling establishment, and he is fully alive to the importance of irrigation. He has what would be a very nice little orchard and garden, which is irrigated, but his business takes him away so much that he cannot devote as much time to it as he would wish. We saw, however, the capabilities of the soil when properly irrigated. Sweet potatoes and other vegetables thrive well, as do citrus, guava, pomegranate, and other fruit trees. There was a large shed full of excellent bush hay, right up to the ridge pole. (Fig. 59.) We called at a dairy farm, owned by Mr. Meadows. He was just flooding a paddock to enable him to plough it for hay crops. The water was carried by means of movable iron pipes. He cultivates a large plot of land for growing fodder for his dairy stock. Mr. Burcher has a very pretty house and grounds just out of the town. He has the most beautiful buffalo grass lawn I have seen anywhere. (Fig. 58.) His oranges and lemons looked very healthy. At one time he had a quantity of good vines, but only a few are left. They did not thrive on the bore water. From 9 acres of land he got 38 tons of wheaten hay and 30 bushels of grain. Of this he sold 4 tons at £20 per ton, and used the rest for his own stock. Here again is evidence of what the land will produce if properly irrigated. As we were driving back to Charleville we met the first shower of rain we had seen on the journey. The rain began at about 10 a.m. on the 19th March, and continued for several hours.

Charleville is a very pretty town, with well laid out streets, all planted with currajong and white cedars (Fig. 48A), which have grown well, and give a charming appearance to the town. It is situated on the Warrego River, 480 miles west of Brisbane. (Fig. 48, 48A.) The town bore is 1,375 feet deep, and the flow over 3,000,000 gallons per day. (Fig. 52.) The whole town is reticulated from this source. The population must reach over 1,500. We drove out to the meatworks, distant about 4 miles. There is no work going on here beyond ice-making. (Fig. 50.) A caretaker, Mr. Fesler, is in charge, who is a most enthusiastic gardener. He cultivates 6 acres entirely by hand, growing all kinds of vegetables and green fodder. (Figs. 53, 54, 55.) I saw him digging sweet potatoes, and they were large and white, and quite free from any disease. He grew some 30 lb. in weight. He uses the bore water. Pumpkins grow to a large size very rapidly. There being no bees to fertilise the flowers, Mr. Fesler has to go over the whole of his pumpkin beds and fertilise them by hand. I saw two which he had fertilised on the 5th of February and on the 20th March; they weighed nearly 50 lb. (Figs. 51, 57.) Mr. Mobsby also took some views of wool teams camped on the bank of the river, just about to harness up, and also one of a loaded team coming up the main street. (Fig. 49.)

On leaving Charleville, I noticed that all the way to Angellalah Creek the trees were nearly all dead, and there was very little grass. The country was very sandy as far as Kurrajong. Then come box-tree flats, with a little dry grass. Very little rain seemed to have fallen here. At Angellalah Creek there is a fine Government dam, which backs up a considerable amount of water. (Fig. 60.) This is needed for the locomotive engines, bore water being injurious to the boilers.

After passing Angellalah there is plenty of good grass and water and live cypress pine. A little rain was falling now. Towards Morven there are many miles of thick brigalow or mulga, but no grass; nothing but red sand. Ten miles west of Morven I noticed the first prickly pear since leaving Cunnamulla. (Fig. 66.) The extensive flats here are very badly grassed, and, as usual, the trees were all dead, and soon we were passing over stony plains, which appeared to reach to some ranges far away to the north. East of Morven the trees once more appeared green, and there was some dry grass on the plains. The timber is dense mulga, cypress pine, some ironbark, box, and gum. Towards Mitchell there is some prickly pear, barren, gravelly ridges, very scrubby, waterless, changing into splendid black soil plains as Mitchell is approached. Here a Mr. Beveridge was ploughing for wheat. Last season, I was told, he had a phenomenal crop. Certainly the soil looked good for large crops, but it appeared better adapted for heavy maize crops.

ROMA.

At Roma we stayed for a day and night, and visited the vineyards of Mr. Bassett and Mr. P. Smith. Mr. Bassett's vineyard has been so often described that it is needless to enlarge on it. He has over 100 acres under vines, but large numbers have died during the drought. These are being taken out, and their places will in due time be taken by new plants. (Figs. 69, 70, 72.) Mr. Smith has 1,280 acres of land, of which 45 acres are under vines. (Figs. 68, 71.) He makes excellent claret and chablis. His extensive orchard of citrus fruit trees has been killed by the dry weather, and will all have to be taken out. During the drought the grass failed, and he had to put his horses out on agistment at 2s. per head.

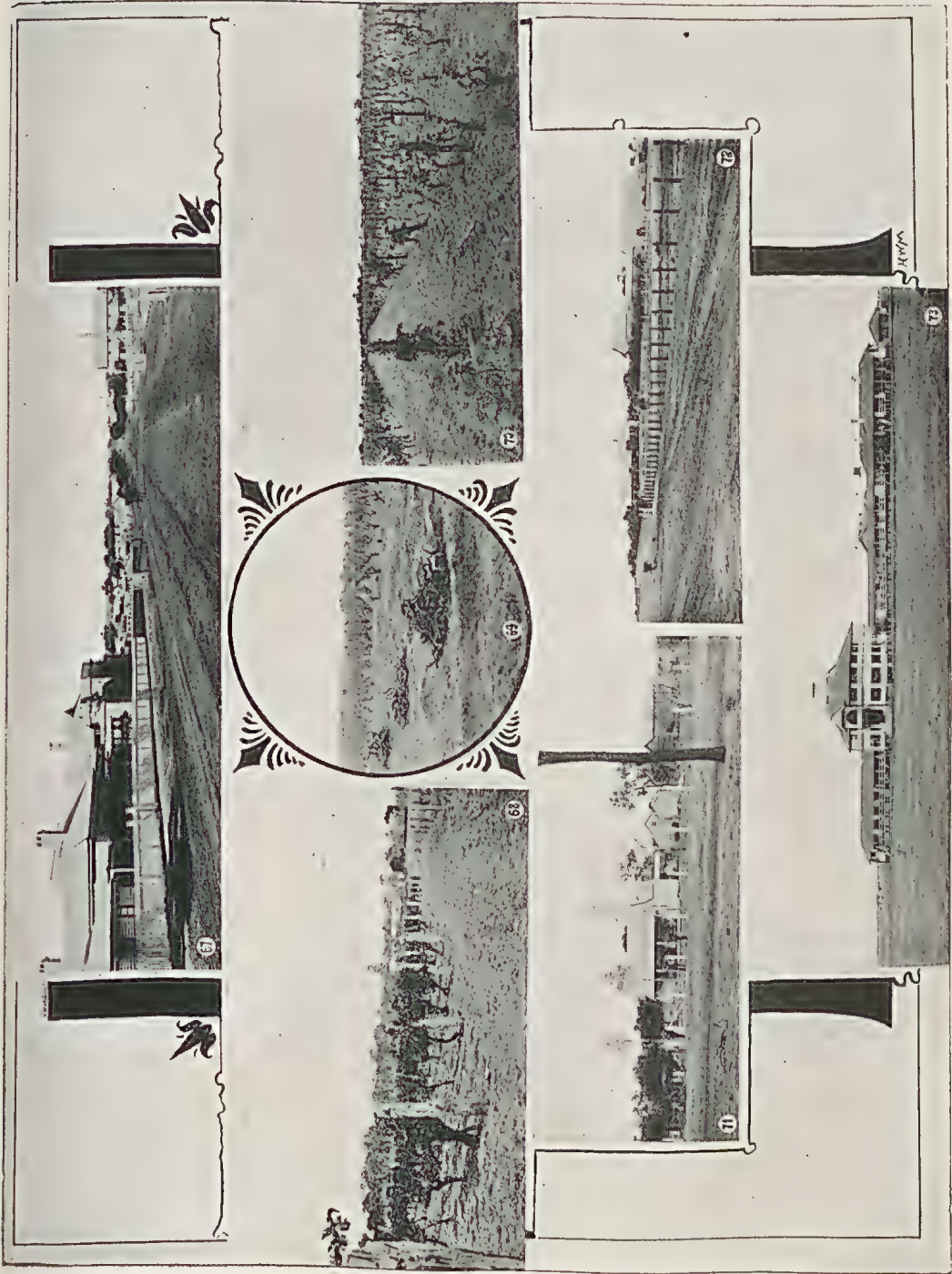
Roma is a rather pretentious town, the centre of a farming and grazing district. (Fig. 67.) It is celebrated for its excellent grapes, which are grown in great quantities and are confessedly the best wine grapes in the State. The Roma wine is well and favourably known, both in Australia and in Europe. In common with other parts of the country, Roma has suffered greatly by the drought, but now that good rains have fallen the district will soon get over its troubles, and farmers and vigneroni will once more rejoice in good harvests and vintages. The population of the town is between 2,000 and 3,000, and the district is steadily growing in importance with the extension of agriculture. When we left Roma it was raining heavily. Thence to Blythedale the country was looking very bad, but there was a perceptible spring in the grass. The prickly pear covers the country in many places. Between Bangalore and Pickenjennie there is good grass for stock, and the Wallumbillah settlers were busy ploughing large areas in preparation for wheat sowing. Heavy rains had fallen here. I noticed some cultivation at Dulacca. (Fig. 61.) From this place towards Dalby there is good grass. At Drillham there is grass all over the ridges 18 inches high, and Chinchilla is likewise blessed. There had been a heavy cyclone here, which blew down a fine hall, and uprooted hundreds of trees. (Fig. 64.) On reaching Jimbour, there appeared to be very little grass, but a gradual improvement was noticeable on this celebrated station nearer to Dalby. Here there had been very heavy rain. On the day before our arrival $5\frac{3}{4}$ inches had fallen between 4 p.m. and 9 p.m. As a consequence, the plains were covered with pools of water, particularly around the sanatorium buildings. (Fig. 73.)

There is no need to continue this description of the country districts, the objective of the journey having been the Far Western country, which has been as fully described as time and the conditions of inspection would permit.

The illustrations of various parts of the Western country were taken by Mr. H. W. Mobsby, and they give a very realistic idea of the condition of the country from Dalby to Thargomindah.

Although I have emphasised the need for intense farming and close settlement in the arid or semi-arid regions of Queensland, it may not be out of place to enlarge still more on the great value and the phenomenal fertility of

Plate XXIX.



DALBY—THE SANATORIUM.

ROMA AND ITS VINEYARDS.

the arid, so-called desert soils before described. Wherever irrigation is carried on on sensible lines, by which I mean judicious application of water, and care for an easy "getaway" for superfluous water, so that there shall be no stagnation, there good crops of cereals, grasses, fruits, and vegetables are produced without the least danger of failure. I have no hesitation in calling dry climates such as those of the Central and South-Western districts blessings in disguise. When the scientific irrigator appears on the scene, the disguise is thrown on one side, and the splendid advantages of such districts come to the front.

What are those advantages? I have mentioned the marvellous fertility of the soil. To this I will add what must be patent to every cultivator of the soil, be he wheat-grower, fruit-grower, or market gardener. What wheat-grower has not seen his crop so "laid" by heavy rains as to be practically destroyed? What fruit-grower has not suffered from excess of rain in the destruction of his fruit, the splitting of oranges, the damage to grapes. Often I have lost good crops of maize owing to the continuous rains causing the grain to sprout. So with sugar-cane. Persistent rain brings out shoots at every joint to the detriment of the sugar content. Floods destroy thousands of pounds worth of crops. If there is any rush of water, the entire soil is washed away. At critical times it is impossible to get on to the land with horses, and even man himself proves too heavy a load for the soil.

What I have seen in these arid districts almost makes me a convert to the belief that rain is a superfluous factor in agriculture, but only in districts where bore water is available or where a plentiful supply of subterranean water can be got, or where a large supply can be obtained by the building of dams as I have suggested for the Warrego country. The agriculturist who is thus situated is independent of rainfall. He can choose his own time for ploughing and harrowing his land. He must naturally take care that he sows and plants in proper season. If he sows wheat or oats in December, it is his own fault if he gets no crop. He can so arrange his irrigation that he can get on to the land and work his ground whenever it suits him, always provided that he has observed the rules regarding drainage which are needed in any irrigation scheme. His crop is always certain. In these arid districts small farms, or farms not exceeding, at the most, 1,280 acres, will be the rule. From 50 to 300 acres could be put under cultivation, and the balance of the land would serve for paddocks, in which thousands of sheep could be hand-fed and hundreds of cattle and pigs could be reared. The possibilities of agriculture in our Western districts are not understood, because men have taken up large areas of from 10,000 to 60,000 acres as grazing farms, and have merely attended to a water supply, without giving a thought to that equally great necessity—a fodder supply. I have already shown how 10,000 sheep could be kept in good condition on a few hundred acres, and although we may not be so advanced as our friends in America, who make large profits on the arid portions of Texas and Arizona, yet we should take a lesson from them, and put our desert country to the good use that Providence intended it for. There is more money in general agriculture in the Central Districts and in the South-Western country than in the magnificent lands of the Far North, where the rainfall is reckoned by fathoms.

NON-SETTING OF SWEET POTATOES.

Mr. G. Ellrott, Emu Park, Rockhampton, writing on the subject of the non-setting of sweet potatoes on "J. O.'s" farm at Gympie, says:—"I have not exactly tried twisting the vines up and placing them on top of the root, but I turn the vines over from one side of the row to the other about once a fortnight, and find that by so doing I get far more useful potatoes than if the vines were left to root. All potatoes that set are fully developed; there are scarcely any small ones. I thoroughly recommend the practice, as it proves quite successful, and the result is well worth the trouble."

MR. N. A. GATENBY'S LUCERNE FEEDING EXPERIMENT.

A correspondent of the *Pastoralists' Review*, who was present on the spot during the experiments, writes to that journal:—

The test of seventy-five sheep per acre had its origin in some remarks made before the Minister for Mines and Agriculture (Mr. John Kidd) at the Forbes show in August last.

Mr. Gatenby, in returning thanks for the successful exhibitors, pointed out that nearly all the sheep prizes had been taken by Messrs. Martin Bros., of Droubolgie, and himself, the two whose stock had benefited by irrigation.

Instancing what could be done by irrigation in the way of saving stock in time of drought, he said that whilst the river was running in the past summer he saved 15,000 sheep on green lucerne cut daily and carted to the sheep.

The river having stopped running, these sheep and others had to be fed at great cost on food bought.

The point sought to be enforced was the necessity of providing a great storage reservoir at the head of the Lachlan, and instances of similar successful work were given.

This statement of 15,000 sheep to 200 acres—equal to seventy-five sheep per acre—attracted the Minister's attention, and was also commented on by several newspapers.

The verdict of the latter was that it was an exaggerated statement, and in this the general public, who had no idea of the results of irrigated lucerne, concurred, thinking that if so carried they would soon be in a dying condition.

To settle the question, Mr. Gatenby offered to set apart a paddock of 20 acres and feed 1,500 sheep from it, pointing out that the conditions were as favourable as they ever would be for such a test—the river running, the lucerne ready, and the sheep, owing to the bad season, having in any case to be fed.

The Minister was so impressed with the value of the experiment that he at once decided to accept the proposal, and, in place of sending up an ordinary working man to feed and attend to the sheep, sent up one of the ablest Government agricultural experts—Mr. A. A. Dunnicliffe.

The test was arranged for 4 months, it being considered that if the sheep were kept in good condition for that period it would be conclusive proof that they could be so kept during the spring and summer months, say 7 to 8 months.

Mr. Dunnicliffe, on arrival, measured the paddock, finding it 22½ acres; 1,685 sheep, equal to seventy-five per acre, were then taken from the run, sheep including crossbred ewes and wethers of all ages and merino ditto. They were placed on 27th October in three small paddocks of about 35 acres each, 562 to each paddock. A fair sample of ten in each paddock were then branded with distinguishing numbers and weighed, in order that their progress or otherwise could be noted. The paddocks themselves were made extra proof by putting anchor droppers on, and in places wire netting. The paddocks were destitute of grass.

The test paddock had a fair crop of lucerne to start with. It had previously in the spring depastured 550 stud ewes for a month, then rested a short time, then cut and the lucerne carted to the general flock; then rested again, and was ready to cut on the 27th October. It was cut into on this date, one man feeding the sheep and giving them a two-horse dray load twice a day—a third of a load to each lot morning and evening. The lucerne was thrown from the cart to the ground, ample room being given for all the sheep to feed. The sheep lost about 1¼ lb. during the first 5 weeks, by which time the whole paddock had been once cut.

This was expected, as they would fret at being shut up in small paddocks. At the end of the 4 months, however, they had regained this, and there was a general gain of over 3 lb. on the whole of the thirty marked sheep—an improvement, of course, shown also in the others.

The wool was fairly well grown. In the whole 1,685 sheep two only died, and one of these was supposed to be a weak one, dropped when taking some

weak sheep through. Three others were killed by the dray running over them. The sheep get so tame, and crowd round the cart so, at feeding time, that accidents of this sort are almost unavoidable.

The paddock was cut once in each 5 weeks, and earlier in the season some hay was made off the paddock and left unused, so as to allow for the part of the paddock cut at and shortly before the conclusion of the test. With this hay the condition of the paddock is now practically as good as when the test was started. In point of fact, the sheep are in their paddocks as left by the Government, and are all being fed in the same way for at least another 5 weeks.

The only reason why they may not be kept till 1st May is that the river stopped running on 1st March, and by the 15th the water stored in the weir will be exhausted.

Given a supply of water right through the spring and summer, Mr. Gatenby is quite confident he can keep seventy-five sheep per acre in as good or better condition than when put in for at least 6 months, and can keep them in good order for 8 months.

The experiment has attracted so much interest and attention that a full report will be issued by the Government shortly. It is likely to give a great impetus to irrigation and water conservation.

IRRIGATION AND UTILISATION OF SWAMP LANDS.

In January last, when describing the sugar lands of Nambour, we drew attention to a new departure in the way of reclaiming land from a state of nature, by the Messrs. Nichol Bros, of Petrie's Creek. They spent over £15 per acre in clearing and stumping a ti-tree swamp. So successful were they in growing crops during the late drought on this swamp land that they decided to bring about 50 acres more under cultivation. Not only in Queensland do we find such enlightened progressive farmers, but they are also to the front in South Australia. The Hon. the Secretary for Agriculture of that State has described the work done by Messrs. H. W. Morphett and Co., who have reclaimed 650 acres of the Murray swamp land. We take from the *South Australian Journal of Agriculture* the following interesting account of

IRRIGATION ON THE MURRAY: UTILISATION OF THE SWAMP LANDS.

BY ARTHUR J. PERKINS, Secretary for Agriculture.

The Murray, that is probably destined to play no mean part in the future of Australia, at present runs away in almost pure waste to the ocean. Individual exponents of the value of irrigation have certainly not been wanting in the past. Unfortunately their isolated and spasmodic efforts have failed to bring home to the general public the paramount economic value of this agricultural practice to a State such as our own. In the closing lines of his preface to *Chimie Agricole* (second edition, 1902), P. P. Deherain, who, after a distinguished career, died last December, expresses himself in the following terms:—"The great enterprise that will contribute most to the glory of the twentieth century, and ensure the continuance of agricultural prosperity, will consist in rendering possible the irrigation of the soil of France, for water is the first factor in fertility." If, in reference to a comparatively well-watered country such as France, these are the last words of a man of commanding ability and vast practical experience, what would he not have said had his lot been cast beneath our hot, dry skies. Our natural facilities for irrigation are comparatively limited; and it is a duty that we owe to ourselves and our successors that not one of them should be allowed to lie idle. In all parts of the world rivers have generally been valued as the highways of commerce, and the means of intercourse betwixt the shore and distant inland communities. It were folly to overlook the great advantages of cheap freight thus provided by nature; and well-regulated irrigation need not necessarily interfere with the navigability of

the stream. The recently expressed opinion that the unwritten law of nations that regulates the flow of watercourses should be abrogated in favour of the States that control the sources of the Murray can receive no support from irrigationists in this State. Not a drop of water that is ours by law can we surrender, as much in the interests of future irrigation as in the interests of the navigability of the stream.

It has often been referred to as a national misfortune that the Murray, in its lower course at all events, does not traverse a more naturally fertile tract of country. Perhaps in times to come, when art has supplied its banks with the verdure that nature has denied, our descendants may see cause to reverse a somewhat hasty inference. Even at the present day there lack not examples to show that, after all, this barrenness of the land, through which the river has torn its course, is only relative; let us remember, with Deherain, that water is the first factor in soil fertility. And next to water comes heat, with which the Murray country is abundantly supplied. Arrest the stream and furnish by artificial means the moisture that is lacking, and there is little that that cloudless sky and potent sun will not draw from a soil, the fertility of which has laid dormant for centuries. Those familiar with the marvellous growth that is characteristic of the pioneer irrigation colonies, Mildura and Renmark, know that the banks of the Murray are not dead, but asleep, and that it wants but the enterprise of man to awaken them to exuberant life. Unquestionably the costliness of the water supply was one of the lions that the colonies on the Upper Murray found barring the way to success. Wherever water has to be raised to a considerable height, its profitable utilisation, even when supplied at cost price, becomes very problematic. As the river approaches its final destination it broadens and expands, eating its way right and left into the vast extent of level land that receives it, until it is lost in Lake Alexandrina. The Murray is subject to periodic floods, which generally synchronise with the melting of the snows in the regions of its sources. Towards its mouth, over the country extending from Mannum to Wellington, and higher up also, in times of flood the river steps out of its natural channel and covers broad stretches of country, that, from their general appearance and the vegetation they carry, have received the name of "swamp lands." I have not been able to secure definite figures as to the area of these swamps; on the lower river they are variously estimated from 10,000 to 20,000 acres, and it is to their value that I wish particularly to draw attention in the present article, for they certainly solve the difficulty of an abundant and cheap supply of water for irrigation purposes, and their profitable utilisation is therefore within reach of those in possession of moderate means. By means of mounds 3 or 4 feet in height these swamps have been partly reclaimed on various points of the river for grazing purposes; and the rank, natural vegetation that has resulted has generally amply repaid the cost of this partial reclamation. It has, however, been left to Messrs. H. W. Morphett and Co., of Wood's Point, to demonstrate definitely what marvellous results may be realised from an intelligent cultivation of these swamps. A recent visit to Murray Bridge enabled me to judge of the importance of the work carried out by these gentlemen, and, whilst they naturally deprecate any hasty generalisation from the results of two or three seasons, I have their permission to quote freely from information they were good enough to supply.

Messrs. H. W. Morphett and Co. have reclaimed about 650 acres of swamp land, of which 200 acres are at present under cultivation. The work of reclamation, though comparatively simple, must have proved no light undertaking. It was necessary to so protect the reclaimed land that the river could pass harmlessly by even in times of highest flood. The 1870 flood is generally taken as the maximum level to which water is likely to rise, and in the neighbourhood of Murray Bridge an embankment 7 feet high will check the encroachments of a flood equal in volume to the one in question. Messrs. Morphett and Co. have, therefore, surrounded their land with an embankment 7 feet in height, and with a base 27 to 30 feet in breadth, tapering upwards at the angle of natural fall of the soil. The soil used for the purpose was quarried

out of a neighbouring cliff, and conveyed in position by a miniature tramway. This soil, however, proved somewhat porous, and let in more water than was altogether desirable. This difficulty was overcome by covering over the river face with swamp silt. I was at first at a loss to understand how a soil, which, when irrigated, appeared so naturally porous and fine, could effectively render the mound impermeable. As will be seen later on, the physical analysis of the soil gives a very simple explanation of the difficulty.

Parallel to the mound runs a channel, which receives the river waters from an iron gate, which can be raised at will. This head channel distributes the water to a series of minor channels, which run at right angles to it, and which consist mostly of simple furrows from which the water filters away right and left. Nature has so arranged matters as to render these swamps almost perfect in their simplicity from the irrigationist's point of view. From the river towards the cliffs or higher lands there is a gradual fall of 2 feet 6 inches to 3 feet, so that the surplus water drains naturally towards the back of the swamp. In addition, the soil, after exposure to air, becomes of so porous a nature that the water appears to wash through it, and Messrs. Morphett and Co. have found that it is not necessary to place the direct supply furrows closer than half-a-chain apart. In such circumstances it must be recognised that the expenses of irrigation are reduced to a minimum, and the extreme simplicity of the system must commend itself to all.

The cost of constructing such an embankment must, of course, be taken into consideration. The owners, who were their own engineers, inform me that they estimated the cost at about £10 an acre; and, further, that, with the experience of the past at their disposal, an equally effective embankment might be raised at a lesser cost. When we consider the sums sunk in capital account for other agricultural enterprises, this £10 per acre cannot be looked upon as excessive. The cost, for instance, of trellising an acre of currants would in most circumstances exceed it. In fact, Messrs. Morphett, I believe, go so far as to state that reclaiming the swamps would prove a profitable undertaking, even had they to build over again the embankment every five years.

On the opposite side of the river I had the opportunity of examining the swamp land in its natural state. Messrs. Morphett have expressed the intention of ultimately reclaiming it for cultivation purposes. To my mind the experiment would not be without risk. At present in times of flood the river can extend freely on one side of its banks, but were it forced to run between two parallel embankments it is to be feared that serious damage to one of them at least must necessarily arise. In the course of time, if schemes are adopted whereby flood waters are regulated in the upper river, this difficulty would, of course, disappear. The general appearance of the unreclaimed swamp is certainly not inviting; it is an entangled jungle of rushes, reeds, and other water-loving plants. In Messrs. Morphett's experience, as soon as free access of water is withdrawn these semi-aquatic plants begin to die off, and are subsequently easily cleared off the land. The swamps will then carry a natural growth of coarse, succulent herbage, which is fed down by sheep, with a view of levelling and consolidating the ground. The following season the soil is broken up with three-furrow ploughs, and worked down with cultivators and harrows. This soil, which is originally inclined to cake and rise in large clods, gradually mellows down under the influence of atmospheric agents into an admirable tilth.

Time alone, of course, can show what crops these swamps can be made most profitably to carry. In two years of cultivation Messrs. Morphett have done much towards elucidating this question. In 1902 they averaged 30 tons of onions per acre, clearing £72 net profit. During the present season they have 20 acres under onions. From malting barley, which, owing to its liability to go down, they find themselves obliged to sow as late as in September, they averaged 40 bushels to the acre, and during the present season they have not less than 120 acres under this cereal. Eight acres of lucerne yielded the first year six cuts, averaging each $11\frac{1}{2}$ tons of dried hay. It is their intention to extend the area to 50 acres during the coming season. Potatoes, piemelons,

mangolds, pumpkins, maize, sorghum, have all yielded magnificent crops. Wheat, owing to its great liability to rust, has been discarded as not suitable to local conditions. I have quoted these results with the full permission of the owners, who recognise that they are as yet in the experimental stage. It is their intention ultimately to rely mainly on dairying and pig farming; and it appears to me that to both purposes the swamps, with their neighbourhood of high dry land, are admirably adapted.

AGRICULTURAL MOTORS.

Although the use of motors on agricultural farms has greatly extended in Europe and America, so far they have not made their appearance in Queensland. Doubtless the cost of the machines has much to do with their non-use. The time is, however, fast approaching when motors, steam, or gasoline will be employed on all large agricultural farms. We described and illustrated in this *Journal* (Vol. IX., p. 494), an automobile exhibited at the Paris Exhibition of 1900, by the Deering Harvester Co., of Chicago. This machine was practically tested in France, and was found to work perfectly, running at any speed and turning corners more easily than a team of horses. This harvester was known as the "Ideal" mower, propelled by a gasoline motor of 6-horse power. Not only did it serve as a mower, but it drew loads, ground feed, pumped water, sawed wood, in fact did everything that a portable or stationary engine could do, and much which these were not adapted for, such as ploughing, harrowing, reaping, &c. With such a machine one man can cut 30 acres of hay in a day. Our illustrations in this issue represent in actual operation a motor of 8-horse power, constructed for ordinary farm work. Hitherto farmers have looked with some suspicion on such machines, but they are in actual work every day on farms in other countries. In one of the illustrations, the motor is represented hauling a double-furrow plough. The cost of fuel for doing this work amounts to 2s. 6d. per acre. In some countries the cost is said to have been as low as 8d. per acre, but this is very doubtful. With this experience, a farmer can plough from 10 acres to 20 acres per day, according to the nature of the soil. The second illustration shows the motor hauling a reaper and binder. The machine may justly be called the "Farmer's Friend," for, like the Deering, not only will it plough and reap, but sow, harrow, cultivate, weed, and mow in addition to hauling a load along any common road. At the barn, it will thresh, dress, and grind corn, husk maize, cut chaff, work the separator, and churn, pump, cut wood, and in many other ways make itself a generally useful farm hand. The engine (steam) has double cylinders, and can travel backwards or forwards, developing 8-horse power. Any intelligent farm hand can drive it after a few lessons.

We are indebted for the above illustrations and information to Messrs. Trackson Bros., automobile engineers, of Brisbane, who are sole representatives for these machines.

SHEEP ON THE FARM.

Every farmer who has sufficient land in addition to his cultivation paddocks to keep 200 or 300 sheep should do so. But he must not trust to the sheep paddock to keep them alive or to fatten them. By growing lucerne crops and hand-feeding them, a large number of sheep can be fattened. Ten acres of good lucerne will keep quite 200 sheep; 10 acres of good couch grass will keep at least 100. They are more profitable to keep than steers or bullocks, for the same feed required for 10 steers will feed 100 ewes. The great mistake made in keeping sheep is over-stocking. Take the Jemalong (N.S.W.) experiment, where 75 sheep were kept per acre on green lucerne, fed to them in bare paddocks. If the owner puts 150 sheep on the same amount of feed, that would

Plate XXX.



THE AGRICULTURAL MOTOR AT WORK.

be overstocking, and the sheep would suffer. Yet hundreds of grazing farmers before the drought did this very thing with the dire results which have everywhere been recorded. Sheep are most useful to the wheat-grower. Great benefit results from judiciously feeding off the young crop. We read of a case in South Australia where a farmer turned the ewes and lambs on to 500 acres of wheat to save their lives. When they were taken off, the season turned favourable, and the owner averaged seven bags per acre from the field. Another man did the same thing, and not only did he save his sheep, but he made £6 per acre from his grain. Of course sheep should not be turned into a wheat field when the crop is high, nor when the land is wet. They will eat a young crop down evenly, and it will afterwards stool out and give a good crop. Sheep are now, unfortunately, less in numbers than before the drought. Ewes are, therefore, worth more money, and are worth keeping, but not after they have dropped their lambs. The ewes, or many of them, should then be sold, and the lambs allowed to come on, otherwise the much-to-be-deprecated overstocking process begins. On the other hand, the lambs might be sold, or some of them, keeping the best for breeding purposes. A good ram should always be kept; one that will cut 15 lb. or 16 lb. of wool. Poor wool-makers do not pay. However many or however few sheep are kept they should be of the best.

We recommend to our readers the article in this issue by Mr. J. Mahon, Principal of the Queensland Agricultural College, on the subject.

SHEEP-BREEDING AT THE AGRICULTURAL COLLEGE.

By J. MAHON, Principal of the Queensland Agricultural College.

We have been, for the past two years, experimenting with cross-breeding of sheep. The breeds selected were the merino (ewes), crossed with the Romney Marsh and Shropshire rams. The progeny from both crosses have been found to do remarkably well, and they are apparently well adapted for the country, climate, and the conditions under which they are raised. No especial care has been taken with regard to the pasture or land on which the sheep have been raised. The animals have been allowed to run upon the pasture land in the near vicinity of the College buildings, having access to the low, damp, marshy land, which, during rainy weather, is swampy in places. Spear-grass, too, is found to make luxuriant growth in good seasons. The old merino ewes suffered from foot-rot and from the effects of the spear-grass, while the cross-breeds were not in any way affected. The sheep were at times put on the cultivation paddocks to eat down the weeds and overgrowth of grass, and for this purpose they may be classed as the "scavengers of the farms."

Although much may be said in favour of both crosses, the Shropshire ram crossed with the merino ewe certainly commands the highest merit. The progeny of the above cross are, to my mind, all that could be desired for mutton, either for home or local consumption. The Shropshire is an early maturing animal, a small food consumer, will live when other breeds would perish, and appears to have the power of transmitting its good qualities to the offspring. It may also be claimed that an infusion of the blood from the quickly-maturing Shropshire will counteract the defects of the more slowly maturing merino. The mutton from this cross, though dark in colour, is hard, good in flavour and texture, and I consider it to be worth as much in our markets as that from the very best pure breeds. It may be said that we cannot go further than the first cross, because of the danger of the animals retrograding in quality, but, in my opinion, the contrary will be the result, provided that a thoroughbred sire be used; one that possesses the male qualities to the full extent, and will be, when used, prepotent and stamp himself on his progeny. Cross-bred ewes from the above, if crossed with the Southdown or Romney Marsh, and back again to the Shropshire, should produce a mutton animal of a high grade.

Comparing the two crosses, as used here, I find that the Romney Marsh cross are not so strong and do not mature so quickly as the Shropshire. We are now killing our cross-bred lambs, ages from 9 to 12 months; the Shropshire cross averaged (dressed weight) 64 lb., while the Romney Marsh, of the same age, average 51 lb. each. In crossing with the heavy rams, maiden ewes should not be selected, on account of the difficulty in lambing and the great percentage of losses.

In our small paddocks, which have been cleared of the timber, I find inexpensive shelter sheds invaluable, because with these the animals cannot be exposed to all conditions of weather when resting. Our sheds are constructed of forked posts, 6 to 8 inches in diameter, placed 3 feet in the ground, and standing 7 feet in height. The shed is then covered with light saplings and brushwood, and 2 or 3 feet of straw or bush hay placed on this. It would be better still if the covering were high enough to allow it to be thatched, as, by this means, the shed would last for a number of years. Under these sheds the ground is always dry, and all the live stock on the farm resort thither during both winter and summer months. No doubt these sheds have a tendency to prevent foot-rot from breaking out amongst our flock. For laying off small areas on the farm upon which to graze the sheep, structures made from cheap timber (light battens) and wire netting will suffice; these, in the form of hurdles, may be easily and quickly removed.

In conclusion, I may point out that, in my opinion, the time is not far distant when nearly every farmer in West Moreton and on the Darling Downs will, in addition to present stock, have small herds of sheep as another means of producing wealth from the soil. This will be found to be most profitable, apart from the benefits that must accrue from the fact of using these animals to consume stuff that is at present wasted on the cultivation lands. I see no reason why every farmer who possesses 150 acres of land or over should not have a number of lambs for export each year. To my mind, it is only a matter of one or two farmers setting the example, others will then speedily follow. In the Laidley district we have a Mr. John Cook, who has been raising cross-bred sheep for a number of years, and that gentleman informs me that it is one of the most profitable branches of his farm.

PEA, OR EARTH NUTS.

As there appears likely to be a demand in Sydney for earth nuts, for the purpose of oil-making, we should be glad to know of any being grown in quantities anywhere in this State. Earth nuts succeed splendidly here wherever they have been grown. Some time ago a farmer in the South grew a considerable quantity, but had great difficulty in disposing of them, the only buyers being Chinamen, who send them for manufacture to China. From data given by one grower to a gentleman in Brisbane, it would seem that the return of his crop was equal to £35 per acre. At 2d. per lb. this would mean nearly 2 tons per acre. No doubt earth nuts are very prolific, and when the main crop is gathered, large quantities are left in the ground. These make good pig feed, and by setting up a rolling fence, to confine the pigs to a small area at a time, the animals would root about and pick up every nut on the field. We have had some inquiry from Sydney as to whether earth nuts are procurable in quantities here, but nothing was said about how much is required or what price would be given.

DESTRUCTION OF PRICKLY PEAR.

Mr. John Rudd, Superintendent of Police at Jaffna, Ceylon, sends us an extract from Mr. J. P. Lewis' "Manual of the Vanni Districts," of that island, on the destruction of the prickly pear (*Opuntia Dillenii*) by the help of a beetle, thought to be allied to the cochineal insect; but this is uncertain, as the

name of the insect was not given to the author of the monograph. Mr. Rudd rightly concludes that his communication may prove of great interest to us in Queensland, and we are much indebted to him for it. He says that the insect seems to have died out, and the *Opuntia* is once more rapidly spreading in the Vanni districts. Not being able to ascertain the name of the insect, Mr. Rudd inquired of Sir William Twynam, K.C.M.G., who was the Government Agent of the Province of Jaffna for many years, and had previously held office at Mannar. Sir William stated that he recollected the insect, and that it seemed to be a beetle, the larvæ of which fed on the juicy leaves of the *Opuntia*, weaving a web over the leaves, on which the eggs had been laid, to protect itself. The beetles soon reduced the *Opuntia* to a condition of pulp, rapidly killing it out to the roots. Cochineal of a kind was manufactured from the beetles, but Sir William could not say whether it was real cochineal, or what is obtained from some beetle allied to the cochineal insect.

The advertisement in the *Queensland Agricultural Journal*, offering a reward for the successful eradication of the prickly pear, does not give the scientific name of the pest; but it is probable that the insect under reference would readily feed on any *Opuntia* closely resembling *Dillenii*.

As the insect now appears to be extinct in Ceylon, Mr. Rudd thinks it might be worth while to correspond with the Government of the Madras Presidency with a view to ascertaining whether any advantage is likely to result from the introduction of the insect into Queensland.

COPY EXTRACT FROM P. 279 OF MR. J. P. LEWIS' "MANUAL OF THE VANNI DISTRICTS," PUBLISHED BY THE GOVERNMENT OF CEYLON IN 1895.

"The Prickly Pear, Nákakalli (*Opuntia Dillenii*), is very common about Mullaitiòu and along the coast. In fact, so much had this exotic spread, that attempts have been made at different times to get rid of it by means of some insect. Large numbers of plants near Máthalau, and some near the Chinnárù, had been destroyed in this way by insects introduced from Jaffna, and some plants at Chemmalai, upon which insects brought from Trincomalie into the Newara Kaláuriga District, and thence into the Vanni, had been put, had rapidly decayed. Mr. Dyke brought some more insects from Jaffna in 1865, and put them on plants at Mullaitiòu. So great was the destruction they caused that three years afterwards, the assistant agent could not find a plant near Mullaitiòu to destroy. Mr. Dyke remarks that this means of destroying the prickly pear must have been much appreciated by the natives for the insect to have spread so rapidly."

EXTRACT FROM DIARY OF 1865-68.

"The Madras Government required its officers to help in distributing the insect in consequence of the great nuisance caused by the spread of this plant."

NOTE BY MR. J. P. LEWIS.

"I suppose this was not the cochineal insect, or the name would have been mentioned."

The above communication is most interesting, and comes opportunely at a time when many schemes are being proposed for the destruction of the pear (*Opuntia vulgaris*) in Queensland, which now covers thousands of acres of plain and scrub land, as far from the coast as Morven, on the Western Railway Line, which appears to be its limit at present. If such an insect could be obtained, and it performed the work ascribed to it, thousands of acres of land would be reclaimed for agricultural and other purposes, and thousands of pounds sterling would be saved to the State.

We have referred the matter to Mr. H. Tryon, Government Vegetable Pathologist and Entomologist, and he will doubtless throw more light on the subject.

CORN STOVER.

Professor Shelton, the first Principal of the Queensland Agricultural College, was a strenuous advocate for utilising every portion of the maize plant for fodder. In particular, he emphasised the value of the stalks for feeding stock. In very few cases were these treated otherwise than as refuse to be burnt. It was only during the late drought that farmers made the discovery that cattle and horses would eat, apparently with relish, the dried stalks chaffed. And, even with that experience, it is still stated that it was no proof of their value that cattle ate them at such a time; they would feed on iron-bark splinters—so hard is it to convince the conservative farmer.

Station, Farm, and Dairy has the following short but valuable article on the subject of

HOW TO MAKE CORN FODDER.

Australian farmers are too apt to go for maize only. If the grain does not form through dry weather at tasselling time, or any other cause, they are content to allow their crop to go to waste. This is very wrong. Corn fodder is a valuable asset on the farm. To make it, allow the corn to stand in the field until the grain begins to harden and the bottom leaves are turning yellow. Secure as much of the fodder as possible while it is green. Cutting must be done before frost, or the blades will be brittle and break off, causing a loss of the best part of the feed. Place in shocks of medium size. They must be large enough to stand well, but small enough to dry out thoroughly. If the corn is of the green order, as it will always be at the beginning of the cutting season, set up about half of the shock, let it stand for several days, until thoroughly cured, then cut the remainder. Shocks 12 by 12 hills are about the best size. The shocks must remain in the field until the entire plant is thoroughly dried. Not only must the blades be well cured, but the stalks must be free from moisture to insure perfect keeping in the stack, or after shredding and storing. The time required will depend upon the season, but usually 5 or 6 weeks will be sufficient. It can then be put into a stack or rick, arranging the bundles or armfuls of fodder as in stacking small grain. If left in the open field, as is often done, there is a great loss from exposure of the surface of the shocks to the weather, and the occasional "twisting down" of a shock. Stack where it will be most convenient in feeding. Running the crop through a husker and shredder is the ideal way of taking care of corn fodder. There is some objection to this method on the score of the fodder moulding. If it is thoroughly dried out before it is shredded, there is little danger from this source. The practical experience of many farmers and feeders has proven this. True, the shredding is expensive, due to the limited capacity of the shredders. Improvements are being made each season, and this objection will be removed before very long. The fodder is left in splendid condition, and is readily eaten by all kinds of stock.

DESTRUCTION OF CHARLOCK.

One of the most troublesome weeds the wheat farmer has to contend with is a member of the *Brassica* genus, or cabbage family. It is called "Charlock." Several varieties of this family occur on the Darling Downs, especially *Brassica sinapis*, but the charlock is also there, and it is the most destructive of all to the young crops. It has white, yellow, or blue flowers, and so is easily recognised. All sorts of sprays have been tried for the purpose of eradicating it. We may refer our readers for some interesting accounts of experiments made with various sprays to Vol. V., p. 253 (1899), of this *Journal*. Mr. G. F. Strawson, a machinist of fame, and also a chemist, invented a spraying machine, which covers a width of 24 feet with its movable arms, which latter can be folded to allow of passage through a gateway. The results obtained by spraying with the "Strawsoniser," as it is called, are wonderful. Mr. Strawson has just published

his fourth Annual Report (1902) on the work of charlock destruction by the help of his machines, and, as one of his machines has been purchased by this Department for use at the Queensland Agricultural College, it will be interesting to wheat farmers to know something about its performances.

The report states that this valuable process has been now adopted by hundreds of farmers, with the result of increased yield of wheat and absence of the weed. It has been conclusively proved that the charlock can be destroyed at any period of its growth by copper sulphate; but a less quantity of the chemical is required if applied when the plant is young. About 50 gallons of a 3 per cent. solution will destroy 95 per cent. of the weed in an average infested crop; in fact, it will destroy all except a few shaded by other leaves, and the increased yield of wheat is more than sufficient to pay all the expenses of spraying. If the weed is not sprayed until it has flowered, more copper is required, and this gives a shock to the corn plant, which will prevent any material increase in the yield. The operation is so simple and easy that an average farm labourer can be trusted to carry it out with half-an-hour's instruction.

For successful working, the chief points to remember are: Have everything in readiness beforehand, and let the labourer be well trained. The material must be pure and correctly measured, and the spray fine. Charlock can be destroyed in growing wheat crops, without injury to the latter, by spraying with 50 gallons of 3 per cent. solution of pure sulphate of copper per acre. Generally, the crops are much improved, and give a better yield where charlock is destroyed, and young grass seeds and clover in the field remain uninjured. Spraying early, when the weed is young, is most successful. The larger sprayers are more successful than the smaller machines.

These are all points in favour of Strawsonising, and a principal point is that, in all the fields sprayed, the increased yield of wheat has more than paid all the expenses of the work.

REPORT ON WORK, QUEENSLAND AGRICULTURAL COLLEGE. FEBRUARY AND MARCH, 1903.

FARM.—During the above months a great deal of work has been done, not only in planting and saving crops, but also in the cutting and clearing of noxious weeds, which have made rapid growth during the present season. We ploughed, harrowed, and sowed with panicum and Cape barley 10 and 5 acres respectively in the sheep paddock. Ploughed a large portion of recently cleared land on Lockyer Creek (creek paddock No. 3), also plots 9 and 11 farm paddock. No. 9 plot (5 acres) was planted with Swede turnips (2 acres); mangolds ($2\frac{3}{4}$ acres); and carrots ($1\frac{1}{4}$ acre). No. 11 plot (15 acres) was planted with lucerne. Panicum from garden plot No. 7 (1 acre) was harvested, yield 2 tons 7 cwt.; also from creek paddock No. 2 plot 2 ($17\frac{1}{2}$ acres), yield 30 tons 12 cwt.; and from calf paddock, No. 1 plot (5 acres), yield 7 tons 15 cwt.; the total yield from $23\frac{1}{2}$ acres being 40 tons 14 cwt. This crop was well saved, and will produce a heavy yield of seed. We prepared land and planted $3\frac{1}{2}$ acres of potatoes in creek paddock No. 3. Thirty-six acres of lucerne were harvested for a yield of $4\frac{1}{2}$ cwt. of hay per acre. Eighteen acres of maize, which, owing to the dry weather, failed to cob, were converted into ensilage, the following being the yields from the various plots:—No. 9 (5 acres), 17 tons; No. 2 (5 acres), 17 tons; No. 5 (3 acres), 15 tons 8 cwt.; No. 12 (5 acres), 27 tons 15 cwt.; 2 acres of Kaffir corn, plot 8, and 30 acres of lucerne, plot 13, were also turned into ensilage, the yields being 10 tons 9 cwt. and 35 tons 2 cwt. 3 qr. respectively, making a total quantity of 122 tons 14 cwt. 3 qr. of ensilage. This is distributed as follows:—No. 1 silo, 34 tons; No. 2, 53 tons 12 cwt.; No. 3, 35 tons 2 cwt. 3 qr.

Very rapid growth has been made by the crops planted during the latter part of January in plot 10 (5 acres). The sorghum (1 acre) is now 11 feet high, amber cane ($\frac{3}{4}$ acre) 10 feet, broom millet ($2\frac{1}{2}$ acres) 12 feet, and Kaffir corn ($\frac{2}{3}$ acre) 6 feet. Planted 4 acres of cow-pea, and 1 acre of velvet bean in plot 1.

All crops have, during the last month, made rapid growth, with the exception of the lucerne; this, up to the present time, has not had sufficient rain to reach the subsoil, or to affect the roots beyond a very shallow depth. The rainfall for the two months has been 6.41 inches—3.81 inches during February and 2.60 inches in March. Rain fell on 21 days in all, the heaviest falls being—25th February, 0.93 inch; 27th, 1.03 inches; 28th, 1.44 inches; 1st March, 0.40 inch; 18th, 0.33 inch; 19th, 0.86 inch; 20th, 0.36 inch.

Miscellaneous work in this department included burr cutting, hauling firewood for kitchen and pumping station on creek, repairing road leading to College Siding, forming and making road past dairy, chaffcutting, filling up implement-shed with material from pit silo now in course of excavation, picking and preparing *paspalum* plants to supply orders. During the two months under review, 33,300 roots of *Paspalum dilatatum* grass have been despatched to various parts of the State, the value of same being £21 1s. 6d.

DAIRY.—During the period under review (February and March) the average number of cows milked was 51—50 in February and 52 in March. They were fed on natural pasturage only. 3,120 gallons of milk were converted into butter, for a yield of 1,348½ lb., and 310 gallons gave 344 lb. of cheese; 5,378 gallons were supplied to the dining hall, 188 gallons to officers, and 419 fed to calves. The increase for the 2 months comprised 3 Ayrshires (females) and 6 crossbreds. We sold 1 Ayrshire, 1 Shorthorn, and 1 grade Holstein bull, for breeding purposes.

PIGGERY.—Sales:—9 Berkshire boars, 18 sows; 2 Tamworth sows; 1 large Yorkshire boar; 1 Mid.-Yorkshire boar, 1 sow; 4 stores, 8 weaners, and 3 porkers were killed for the dining hall. The increase comprised 10 Tamworths and 8 Berkshires. A new departure has lately been made with reference to the meat supply. Instead of letting a tender for the supply to a butcher, as has been the custom heretofore, it has been decided in future to kill our own meat. One benefit will be that it will now be possible to give instruction to the students in killing and cutting-up, which we have hitherto been unable to do.

GARDEN, ORCHARDS, AND VINEYARDS.—The vineyards and orchards, both on the hill and creek, have been kept in a thorough state of cultivation and free from weeds. In the creek orchard suckers have been removed from the trees, in compliance with Mr. Voller's directions, and in both orchards the ground around the trees has been forked up. In the vegetable garden, successional sowings have been made of lettuce, beans, broccoli, cabbage, cauliflower, kohlrabi, kale, radishes, leeks, onions, parsnips, carrots, sage, marjoram, parsley, peas, swede turnips, and beets. Five hundred cabbage plants, put out in the middle of February, perished during the heat wave; the rows were filled again, but practically all died during a further spell of heat. During February a great deal of irrigation was carried on, but the results were not so satisfactory as formerly, owing to the intense heat. Very little irrigation was needed during March, good rain having fallen. The asparagus beds have been forked up, and several small cuttings taken off. A great deal of ploughing has been done, some pieces of land having been ploughed several times to eradicate couch grass.

MECHANICAL DEPARTMENT.—A new stable has been built, the material used being for the most part bush timber, and the iron saved from the hay-shed, which was burnt down last year—accommodation, 8 stalls. The poultry yards have been extended. In the blacksmith's shop a new scuffler has been constructed. A refrigerating coil has been fitted in the cheese room, and a new feed pump attached to the boiler at the dairy. In addition, the ordinary routine work, horse-shoeing, repairing implements, &c., has kept all hands fully occupied during the two months under review.

CUZCO MAIZE.

In the January (1903) issue of the *Journal* we described a large white maize which grows to a phenomenal height and produces extraordinary crops in South America. The grains of this maize are not solid, but have the appearance of a quantity of flour contained in a thin, brittle shell. The stalk grows to a height of from 20 to 28 feet, bearing from 2 to 3 ears on a stalk, each ear from 18 inches to 20 inches long and from 3 to 4 inches in diameter. It takes 7 months to come to maturity. Trials of this corn have been made in South Africa, but failure has always resulted. Lately some seed was imported by the New Zealand Department of Agriculture. Professor Kirk, of that Department, sent some seed to South Australia, and there, although the season was adverse to maize culture, yet, under irrigation, some plants grew to a height of 11 feet, and most of them attained 9 feet. Some of the cobs were 17 inches long and 4 inches in diameter, and then were not fully grown. If this maize can be acclimatised here it will prove a great addition to the fodder plants now grown for dairying purposes.

IRRIGATING LUCERNE.

By JOHN MAHON, Principal of the Queensland Agricultural College.

Before proceeding to carry out a scheme of irrigation for lucerne, grasses, or clovers, many matters require careful consideration. The first is—Can sufficient water be procured at a cost that will leave a reasonable profit to the producer for the expenditure incurred? Secondly—Is the water available suitable for irrigation? This can be determined by chemical analysis only, because it may happen that the first application, or even the second or third, may produce good results, and later on it may be found that, owing to the unsuitability of the water, the land is ruined for all time. The third condition is, whether the natural conditions of the soil are suitable for irrigation, and the quantity of water that may be used without bringing about deterioration or souring the land. We may take it for granted that all land that will produce a crop of lucerne is suitable for irrigation, but the quantity of water applied must be in accordance with the conditions of the soil. If the natural conditions of the soil show that artificial drainage is not necessary, the danger of applying large quantities of water is not great; if, however, the subsoil contains a large proportion of clay, or is impervious to water, the greatest care should be exercised in regulating the quantity of water to be applied, also as regards its distribution. The preparation of the land for the reception of water is another matter which requires special attention during the process of cultivation. The land, when ploughed, should be graded, all holes and depressions filled in, and the land left in such a condition that the water may be easily and evenly distributed. A cheap implement may be constructed for this purpose, but if the holes or depressions are deep a scoop must be used, after which an inexpensive wooden grader may be employed; this may be constructed of sawn timber, the scraper to be made of 8-inch x 2-inch hardwood, to which a frame with shafts or pole must be attached. (Rough sketch herewith). The "Champion Road-making Machine" may be used with better results, but the cost of this would be much greater. When the ground has been prepared for the reception of the water, the drains must be constructed in such a way as to enable the water to be well and evenly distributed at the smallest cost, and in such a manner that the implements used in harvesting will not be destroyed by continual hauling over drains and ditches. The flooding of lucerne crops with small quantities of water (anything under 30,000 gallons per hour) is utterly impossible, and for this reason the hose system of distribution must be carried out in such cases; this, owing to the amount of labour required, is somewhat costly. It is therefore patent that our drains must be laid out to suit our water supply. In laying off drains, it is first necessary to have levels taken, otherwise a great deal of

unnecessary work will be entailed. The pump should be placed at the highest point of the field, or at anyrate the water should be elevated to the highest point, and from this a main drain or ditch constructed about 18 inches above the level of the ground proposed to be irrigated. This may easily be done by banking up two or more furrows on each side with a double-furrow plough, and the ditch formed in the centre wide enough to carry the quantity of water which it is proposed to use. From this contour, or main drain, lateral drains should be made in accordance with the fall of the ground. These may be built up in a manner similar to that employed in the main drain, and laid out in such a way as to use as little hose as possible—about 6 chains is a reasonable distance; 3 chains of hose will then reach the middle point from either side, assuming the fall from the channel to be suitable. These drains should be from 8 to 12 inches higher than the level of the field, so as to give sufficient pressure through the hose. The hose should be in 15-yard sections, and telescoped at each end, thus making a watertight joint, which is easily broken. The material used may be strong calico or duck, 8 inches in diameter, tacked on to a wooden box or nozzle, 12 inches x 8 inches at large end, and tapered to the size of the hose at the small end where the hose is tacked on. Irrigation should be commenced at the far end, so that the person in charge can work on dry land. Where a sufficient supply of water is available, the hose may be dispensed with, and the cost of distribution considerably reduced. This may be done by diverting the water at various points in the lateral drains, thus causing the water to flood the land. Regarding the quantity of water required at each application, one must be guided by circumstances. For instance, if deep cultivation is employed, less water will be needed, moisture being contained in the soil at the time of applying the water, and rainfall occurring during time intervening between each application. Allowance must also be made for loss of water while being conveyed through the channels to the actual place of distribution.

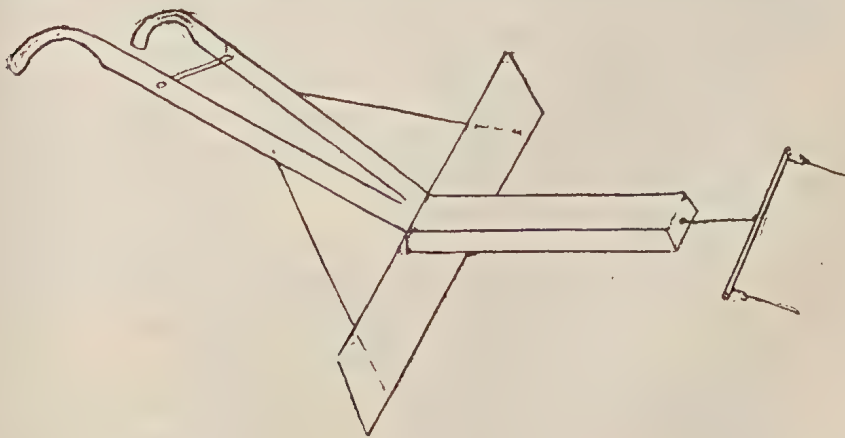
The following are the particulars of the scheme carried out at the College, together with the cost of applying the water and the weight of lucerne:—The piece of land selected for irrigation (24 acres) is situated on the banks of the Lockyer Creek, extending back 10 chains in an easterly direction. The pumping site was selected at the highest point on the bank of the creek. A contour drain was constructed as near to the edge of the creek bank as was found convenient for the work. This ditch was not built above the level of the ground, as previously recommended, because of the limited time at our disposal and the necessity of producing a crop as soon as possible. This drain was made by simply working a single furrow plough up and down, the furrows, by this means, being turned in the opposite direction to each other, thus forming a ditch about 10 inches deep. From this main drain smaller drains were cut by turning a single plough furrow; these ran to the extreme eastern boundary of the area under review. In the contour ditch at the head of these lateral drains the water was diverted and carried to the furthest point where distribution took place. In this connection, difficulties arose because of the small flow of water, slight depressions in the ground, and also through the large open cracks to be found in the soil, brought about by the long spell of dry weather. In using the hose, one section of it was tacked on to the end of a box, which was made of light pine timber, and placed in the drain at suitable distances, according to the length of the hose. Distribution was commenced at the most distant point, so that the persons in charge were enabled to work on dry land. The hose, which was made 8 inches in diameter and in 12-yard sections, was broken at each section when the work as far as the respective sections was reached. As the land was laid off into 2, 3, and 4-acre plots, dealt with separately, no difficulty was encountered as regards estimating the quantity of water applied to each acre. I may mention that the spring-toothed harrows were put over the land before applying the water; this opened up the soil and prevented the water from running hurriedly over it. During the first watering a quantity equal to 3 inches of rainfall was applied to 24 acres of lucerne, and three weeks afterwards a second application of 2 inches was given. The 24 acres yielded 28 tons

16 cwt. of green lucerne, equal to about $8\frac{1}{2}$ tons of well-saved hay. A correct account of the actual cost of irrigating the 24 acres was kept, the result being within a fraction of 8s. per acre. A second crop was raised by applying one watering at the rate equal to 3 inches of rainfall, the yield being 4 tons 9 cwt. of green lucerne and 11 tons 11 cwt. of hay, which was a better crop than the first. The water was obtained from the Lockyer Creek, and elevated to a vertical height of 48 feet by means of a centrifugal pump (Invincible). The piping is 5 inches in diameter and the suction valve 4 inches. As the distance from the water level to the top of the creek bank was 114 feet, it was found necessary to place an intermediate gear between the pump and the engine; this meant a considerable saving in the wear and tear of belting. The pump was worked by a portable engine, with a supposed capacity of 6-horse power. Thirteen hours were worked daily; water raised per hour, 15,000 gallons. The following are the particulars of the cost per day:—

	s.	d.
Labourer, acting as engine-driver	5	0
Labourer, attending to distribution	5	0
Student, attending to distribution	2	6
Fuel	5	0
Wear and tear of belting and hose	3	0
Oil	1	0
Total	21	6

Area irrigated per day, 2.8 acres, equal to a rainfall of 3 inches per acre.

The following are the particulars regarding the cost of fuel for a ten days' run:—Engine, $7\frac{1}{2}$ -inch cylinder, 10-inch stroke, 4 feet 6-inch flywheel, speed 150 revolutions per minute, working under a pressure of 80 lb. of steam. Quantity of water raised per hour, 15,000 gallons. Sound solid wood was selected for this trial, cut into suitable lengths, and weighed daily. The engine was kept running for 13 hours each day, or 130 hours in all. The quantity of fuel used during that time was 8 tons 1 cwt. 16 lb. The cost of hauling, cutting, &c., amounted to 3s. per ton; 1,804 lb. were used per day of 13 hours.



SCRAPER.

Iron handles, iron frame, and wooden beam; scraper made from sawn hardwood 8 inches x 2 inches, length about 10 feet, faced with light iron to prevent soil adhering. A wheel in front of the beam would improve the implement.

THE ONION FLY.

One of the greatest enemies of the onion is the onion fly. We have not yet become aware of its presence in any part of Queensland; but where onions are grown in quantities it would be strange if their enemies did not find them out. At any event, it will be as well if we put growers in the way of detecting it should it unfortunately reach this State. It is possible that it has made its appearance in some of the onion districts of Victoria, since *Garden and Field*—a reliable Victorian and South Australian rural journal—describes the pest, and prescribes the remedy as follows:—"The first indications of the presence of this fly are shown by the first leaves of onion plants becoming yellow, and later whitish, and gradually other leaves also decay. The bulb is small and badly shaped. Yellowish maggots feed on them, which then rot. The dark grey fly lays 6 to 8 eggs on an onion plant, from which larvæ, one-third of an inch long, appear in 5 to 7 days. After 13 to 15 days pupation takes place, either in the onions or usually in the earth, from where the fly appears in 13 to 16 days. There are several generations of this fly during the year. Spraying with 3 pints of kerosene to $\frac{1}{2}$ lb. soft soap, with 1 gallon of boiling water first for mixing, and afterwards diluted with 6 more gallons of water, or, for young onions, even 7 or 8 gallons is useful, but may have to be repeated. Sprinkling with soot and lime is good so long as the pungent odour has not escaped, when it must be repeated. Kainit broadcasted and hoed in very lightly on land cropped with onions at the rate of 5 cwt. per acre has been of great use; at all events, it prevents the maggots crawling from one onion to another, either by the pungent emanation from it or otherwise. Nitrate of soda, at the rate of $1\frac{1}{2}$ to 2 cwt., may force the growth away from the enemy."

PASPALUM DILATATUM.

By JOHN MAHON, Principal of the Queensland Agricultural College.

Having been the first to bring before the notice of the public of Queensland this valuable grass, some 7 years ago, I have experimented with it under different conditions, and watched its progress very carefully, and the more knowledge I acquire of its habits and growth the more strongly am I convinced of its value, not only for pastoral purposes, but also as a fodder. This grass is a native of South America, and was introduced into Victoria many years ago by the late Ferdinand von Mueller, C.M.G., M.D. Ph. D., F.R.S., who, in his work "Extra Tropical Plants," published in 1881, says:—"Paspalum dilatatum is an excellent grass for fodder. A Mr. Bacchus found it hardy in Victoria up to a height of 2,000 feet. It grew in New South Wales after drought was followed by heavy rains $4\frac{1}{2}$ feet in little more than two months. It is closely allied to the Mexican *P. virgatum*, L. Introduced into Australia like many other fodder grasses by the writer." It was introduced to the northern rivers of New South Wales about 11 years ago, and at that time people knew very little of its value as a food for stock. I think I am right in saying that Mr. H. Morton Williams, Wollongbar, New South Wales, was the first man on the northern rivers to make the actual feeding value of *Paspalum dilatatum* known in that district; and, indeed, it was this gentleman, together with the then Mayor of Lismore, Mr. O'Flynn, who brought the grass before my notice, and also supplied me with the seeds and plants which were distributed at the Agricultural College and State farms about $6\frac{1}{2}$ years ago. Even then, although I brought the value of the grass prominently before the notice of farmers and dairymen, people were slow to introduce it into their fields. Even now, there are farmers who are averse to innovation; these, however, are gradually realising the value of *Paspalum*, and also the importance of improving our natural pastures. Regarding *Paspalum dilatatum* as a grass for milk production and for fattening stock, I think I am within bounds in

saying that, all things being considered, it surpasses all other grasses known to us as a permanent pasture. It possesses great drought-resisting qualities, and frosts will not injure it. We have had a fire through it, and when rain came the grass made rapid growth, and was in no way damaged by the effects of the fire. We have had it grow to a height of 5 feet in 9 weeks. Trampling it down and eating it off with stock does not injure it. The soft and succulent nature of the grass induces stock to relish and eat every part from crown to head. When cut and saved at the proper stage, it makes an excellent quality of hay; with us, 1 acre has yielded 22 cwt. of good hay. When milch cows are grazed on the *Paspalum* field, the flow of milk increases rapidly and the cows put on condition. Although we have not yet grazed our sheep on the grass, I feel inclined to believe that it will prove equally good for this class of animal. Cultivation:—In raising this grass from seed I have encountered some difficulty, but, from experiments and observations, I think I have discovered where the trouble lies—viz., that I have been planting the seed too deep (from 1 inch to 2 inches), with the result that very little of the seed germinated, and some remained 10 months dormant in the ground before germinating, while seeds that had no cultivation whatever germinated and grew well. I have now come to the conclusion that the best method of planting is to plough the land, harrow, and plant the seed at the rate of 10 to 15 lb. per acre (according to quality), and then run a light brush harrow over the land. The best time to plant seed is in the autumn or spring, because better growth will be obtained during warm, moist weather. In planting roots, the best method is to plough a furrow about 3 or 4 inches deep, set the grass in this, and cover by means of a lighter furrow. Plant about 4 feet between and in the rows. The first crop should be allowed to shed its seed; this I consider to be the best and surest means of establishing the pasture. In uncultivated fields, the grass may be grown with a considerable amount of success by scattering the seed in places where the land is not carrying too much grass. There is a striking feature in connection with the ripening of the seed—viz., that although the grass may be of the same height, still the seeds do not ripen simultaneously—some ripen and fall, then others, and so on for 4 or 5 weeks. Owing to this, we cannot claim to get more than 70 per cent. of seed that will germinate. *Paspalum dilatatum* will grow on almost any class of soil, but the best results will be obtained from scrub, or heavy black soil. During the whole of the drought the *Paspalum* kept green, and responded to every little shower. The College has been the means of distributing a very large quantity of this grass, and during the last 5 months 104,300 plants, valued at £68 15s., have been sent to all parts of Queensland, also a quantity of seed. Regarding important matter of this kind, I consider that we should be in the possession of facts, ascertained by actual results, before attempting to disseminate information about matters of which we may ourselves be in doubt. In respect, however, to what has been written above, the writer can truthfully say that all particulars are based on actual results.

Dairying.

THE DAIRY HERD.
QUEENSLAND AGRICULTURAL COLLEGE.

RETURNS FROM 1ST TO 31ST MARCH, 1903.

Name of Cow.	Breed.	Date of Calving.	Yield of Milk.	Per cent. Butter Fat, Babcock Test.	Commercial Butter.	Remarks.
			Lb.		Lb.	
Annie Laurie	Ayrshire...	10 Aug., 1902	542	3.9	23.67	
Annie	"	1 Nov. "	508	4.1	23.33	
Amy	"	14 Feb., 1903	732	3.6	29.51	
Laura	"	12 July, 1902	655	3.8	27.87	
Laverock	"	14 Aug. "	650	3.6	26.21	
Lass	"	11 July "	551	4.4	27.15	With first calf
Linnett	"	10 Sept. "	711	3.6	23.66	
Lowla	"	31 Oct. "	500	4.2	23.52	
Lavina	"	5 Sept. "	640	3.7	26.52	
Renown	"	21 April "	214	4.5	10.78	
Ruby	"	24 July "	594	3.9	25.94	
Rosebud	"	4 Dec. "	892	3.8	37.96	
Ruth	"	18 Dec. "	655	4.0	29.34	
Ream	"	10 Jan., 1903	645	3.9	28.17	
Ream Routhie	"	4 Feb. "	748	3.7	30.99	
Lena	"	26 Feb. "	1,016	3.9	44.38	
Leesome	"	27 Feb. "	1,130	4.0	50.62	
Bonny	"	15 May, 1902	409	3.9	21.90	
Lonesome	"	28 Feb., 1903	516	3.6	20.80	With first calf
Playful	Jersey	3 July, 1902	531	4.9	29.14	
Stumpy	"	17 Mar. "	333	6.6	24.61	
Sweet	"	6 June "	167	4.3	8.04	With first calf
Ivy	"	24 Oct. "	491	4.7	25.84	
Jersey Belle	"	17 Jan. "	543	4.4	26.76	
Carrie	"	15 Sept. "	562	4.4	27.70	
Effie	"	17 Nov. "	678	4.7	35.69	
Eileen	"	4 Nov. "	545	5.1	31.13	
Guinea	Shorthorn	9 June "	515	3.7	21.34	
Kit	"	27 Nov. "	743	4.1	34.12	
Lucy	"	14 Aug. "	638	4.1	29.29	
Dora	"	12 Jan., 1903	662	3.9	28.91	
Louisa	"	3 Jan. "	693	4.0	31.04	
May	"	26 June, 1902	126	4.2	5.93	Dry, 25-3-03
Nestor	"	31 July "	654	4.4	32.23	
Queenie	"	2 Sept. "	577	3.8	24.55	
Rose	"	10 April "	435	4.4	21.43	
Violet	"	6 Dec. "	625	3.6	25.20	
Winnie	"	17 June "	513	3.6	20.68	With first calf
Drone	Grade Shorthorn	12 May "	159	4.2	7.48	Dry, 25-3-03
Lemon	"	18 June "	582	3.8	24.77	With first calf
Peggie	"	19 April "	385	4.7	20.26	
Princess	"	5 June "	381	4.1	17.49	With first calf
Rowly	"	22 April "	200	3.9	8.73	Dry, 31-3-03
Rosella	"	1 Dec. "	503	3.3	18.66	
Fancy	South Coast	19 Jan. "	285	5.1	16.28	
Grace	"	1 Sept. "	531	3.8	22.60	
Topsy	"	4 Oct., 1901	281	4.1	12.90	With first calf
Brindle	Grade Jersey	6 June, 1902	371	4.4	18.28	With first calf
Witch	"	13 May "	484	4.2	22.77	With first calf
Night	Holstein Devon...	29 April "	387	4.7	20.37	With first calf
Angel	"	1 Feb., 1903	730	3.7	30.25	With first calf
Mona	" Sh'rth'n	3 June, 1902	665	3.8	28.30	With first calf
Reanie	"	7 Mar. "	494	4.4	24.34	With first calf
Vera	Grade	9 Mar., 1903	375	3.7	15.54	With first calf
Blank	Ayrshire Jersey	25 Mar. "	104	5.0	5.82	With first calf
Tussle	" Sh'rth'n	10 Mar. "	319	4.0	14.29	With first calf
Lottie	"	17 June, 1902	131	4.5	6.60	Dry, 22-3-03

The herd was fed on natural pasturage only.

MORE POINTS ABOUT ANGORA GOATS.

The interest which has been aroused on the subject of Angoras induces us to give a few more particulars concerning them, which have been abridged from the *American Sheepbreeder* by *Garden and Field*. Those who wish for full and reliable information about the Angora should read Mr. Conwright Shriver's book (Longman and Co.), which is the best published on the subject. The remarks in this article refer to Western American conditions, where there is a severely cold winter:—

1. Are Angora goats more profitable than sheep?

Angora goats are more profitable than sheep where your range is too rough, poor, and brushy for sheep, and especially if you want to run cattle and horses on the same range and leave the grass for the larger animals. It is very profitable to run some goats with sheep, particularly where there are more or less brush and weeds in the sheep range.

2. Are they more troublesome to raise than sheep?

They are less troublesome to raise than sheep when you have learned how to manage them.

3. Should they always be herded?

Angoras can easily be trained to come home at or before sundown, and are more regular about their home-coming than any other kind of stock. And where there are no wolves or other kind of wild animals they need not be herded.

4. Can they stand a cold climate?

They stand more dry cold weather than any other kind of stock, and should always have a dry shelter during cold rains.

5. Do they protect themselves against wolves and dogs?

They will protect their young kids quite bravely, but when overpowered will give up the fight and run.

6. Is their meat as good as mutton?

The meat of the Angora is not surpassed in flavour and wholesomeness by any other flesh in the world, and many people believe it surpasses all other meats.

7. Must they be fed in winter?

On good range the Angora needs no other feeding.

8. Are they as prolific as sheep?

Generally the doe Angora brings but one kid annually, unless there are twins.

9. What is the average price of mohair?

Good mohair from well-bred goats brings from 25 to 40 cents per lb., according to quality and demand.

10. How should Angora muttons be when sold to the butcher?

If you have only a few Angora muttons you can sell to your neighbours what you do not use yourself, but it pays better to keep them to raise mohair until they are 8 or 10 years old, especially in the south, where they are shorn twice a year.

11. How much mohair will the Angora produce yearly?

A good, well-bred Angora should shear 6 lb. a year on good range.

12. How many Angoras can be kept to the acre of brush land pasture?

On good range, where there is plenty of weeds, herbs, small trees, brush, and other thick undergrowth, you can raise about five goats to the acre, but they should not be kept too long on the same range—at least no longer than they keep "rolling fat" all the year.

13. Do Angoras need running water?

Running water is best for goats, but dam water will do where it is not befouled by urine, manure, mud, &c.

14. To what age can they be profitably kept?

It pays to fatten Angoras for meat and their pelts at 14 or 15 years of age.

15. Are they dainty as to what they eat?

They will eat any kind of food that is good for cattle.

16. Are they subject to disease?

Angoras are as healthy as any animals in the world.

17. Is it hard to keep them within a fenced pasture?

They are not so easily kept fenced in as sheep, but a straight, upright rail, board, or wire fence, 3½ feet high, will hold them if there are no holes large enough to crawl through. They will climb over and crawl through, but will never jump a perpendicular fence.

18. Is it troublesome to make the does own their kids?

Does that are soon to bring kids should be kept in a separate pasture until the kids are a few days old. If handled in this way there is little trouble over their not owning their kids, as they generally show great affection for them.

19. Will a doe give more milk than a kid will suck?

The first few days after kidding it is necessary to milk the deep-milking does until the kid is large enough to take all the milk.

20. Can they easily be broken for milking?

Goats can easily be trained to jump upon a box, or bench, to be milked, and their milk is said to be the most wholesome of any milk in domestic use.

21. Are the bucks bad about fighting?

I never owned an Angora buck that ever offered to fight anybody. They will fight each other, and sometimes fight dogs, wolves, hogs, &c.

22. Will the goats come home at night?

They will come home before sundown with more regularity than any other farm animal.

23. Do they need warm stabling in the winter?

While they need no warm stabling, a good shelter in cold, rainy weather is quite necessary, and they like to keep their feet dry and clean. They like petting, and a little salt twice a week, and love to get a few kernels of corn when they come home at night, not objecting to a larger feed, which they appreciate, and can be fattened with a little grain in addition to the roughage they find in the woods.

AUSTRALIAN BUFFALOES.

Two years ago a gentleman in Queensland wrote an account of buffalo hunting in the north-west of Australia. The story was sent to the *Wide World Magazine*, and was rejected by that journal, as well as by two other notable magazines, on the ground of its improbability, as a gentleman who had visited Point Parker, Camooweal, and Port Darwin told the editors that there were no buffaloes there. In the *Queenslander* of late date there is an account of Cresswell Cattle Station, 180 miles from Camooweal, the property of Mr. S. Innes, who was in Brisbane in March last, and who told the *Queenslander* reporter that the buffaloes come in and mix freely with the cattle, without, however, cross-breeding. Now we find in the *Pastoralists' Review* for 16th March, 1903, the following:—

It is reported that Mr. E. O. Robinson ("Buffalo Bill"—not the famous Colonel Cody) has sold his magnificent property, Melville Island, with 60,000 buffaloes, to a Vancouver syndicate, at a price considerably in excess of what he offered the same property at in Melbourne 12 months ago. *Apropos* of buffaloes, I may state that Mr. E. Holmes, of this port (Port Darwin), has recently entered into contract with several Thursday Island (Queensland) pearling firms to supply them with 30 tons of barrelled buffalo beef per month. Perhaps this is the beginning of the end with regard to buffaloes. Let us hope that some use will at last be found for the flesh of the hundreds of thousands of buffaloes that are annually slaughtered for their hides and horns only in this territory.

BACON-CURING AS CARRIED OUT AT THE HAWKESBURY AGRICULTURAL COLLEGE.

DRY AND BRINE CURING.

DRY CURING.

In dry curing the bacon is rubbed daily for 9 days. For the first day's rubbing coarse salt, with a small quantity of saltpetre, is used. For five pigs weighing from 130 lb. to 140 lb. it takes about 50 lb. of Liverpool salt and 10 gr. of saltpetre. For the other 8 days a mixture of equal parts of brown sugar and salt is used. On the first day the sides are rubbed until the salt commences to stick well, which is generally in about 7 minutes. The first two days' rubbing are the most important, and unless the meat cures then it may be considered that it is in an unsuitable condition for curing. The salt and sugar mixture is used for imparting flavour as well as for curing. After the rubbing is finished the meat is stacked in a tank or vat, first putting a thin layer of salt on the bottom; a layer of sides is put on this with the rind side downwards, then another layer is crossed on this, and so on until all the bacon has been put in the tank. It is then turned every day for a week, the sides which are at the top to-day being at the bottom to-morrow, and so on. This allows the pickle which is made during the curing to be well distributed over all the sides. After the first week it is turned every other day from 2 to 3 weeks, varying it according to the size of the pigs. It is then ready for washing, drying, trimming, and smoking.

BRINE CURING.

Two pounds of Liverpool salt are dissolved in every gallon of water. The liquid is then strong enough to float an egg or a potato. To every gallon of the liquid the following is added:—4 lb. brown sugar, 2 oz. saltpetre, 2 oz. sal-prunella, $\frac{1}{2}$ lb. allspice; and to every 50 gallons add 1 lb. ground peppercorns. The allspice is sewn in a cotton bag to prevent it from mixing with the pickle. The pickle is boiled for an hour, and is ready for use as soon as it is cold. This pickle can be kept in constant use if it is boiled every 2 months and replenished with spice, sugar, &c. Boiling causes all blood, fat, &c., to rise to the surface, when such matters can be easily skimmed off. Pickle properly looked after becomes stronger and more valuable with age, and will last a long time. The pork must be cold, or it will not take the salt properly. The colder the flesh the easier it is to cure, proving the advantages of a refrigerator. Pump pickle into the shoulders and hams—from two to four injections in the shoulder and two to three in the hams, according to their size. Three tanks or tubs are necessary. Those at the college are built of brick and cemented. Have bacon tank No. 1 empty. Cover bottom of tank with a thin layer of salt, then place a layer of bacon, taking care, should any of the sides overlie each other, to put a sprinkling of salt between. Sprinkle salt all over the pork, and also sprinkle very lightly with saltpetre; then pack another layer of bacon crossways upon the first, and so on until all the bacon is in the tank. When packing the tank, keep every layer as nearly level as possible. Batten the meat firmly down, and cover the whole with pickle. If using new pickle, add 1 lb. of brown sugar to every ten sides, dissolving it in pickle before use. Miss one whole day before turning the bacon into No. 2 tank—namely, bacon put into No. 1 tank on Monday should be turned into No. 2 tank on Wednesday, and into No. 3 on Friday. The bacon will then be ready to take out of pickle on Monday, giving it 7 days in tanks. Use saltpetre in No. 1 tank only.

WASHING.

After the bacon is cured, it is placed in water just warm enough to bear one's hands in, and is then brushed over with a dandy brush, which removes all fat, sugar, slime, &c., from the surface. It is then placed in a tank or vat, and covered with clean, cold water, in which it is allowed to remain for from 18 to 24 hours. This takes a lot of salt out, and renders it a mild cured bacon.

DRYING.

The bacon is next hung up in a well-ventilated room to dry. If the weather is favourable—*i.e.*, if the days are fine and dry, with a slight breeze of wind during the greater part of the time—the bacon is generally sufficiently dry in from 6 to 7 days.

SMOKING.

The bacon is then placed in the smoke-house. The fireplace is outside the smoke-house, and the smoke is conveyed through a flue to the interior. This allows of the bacon being smoked in a cool state, which is, of course, a great advantage. Native apple tree and hardwood sawdust, also damp maize cobs, are used, and they are generally considered to somewhat improve the flavour of the bacon. From 4 to 5 days' smoking is given, care being taken not to smoke too much, as this greatly affects the flavour.

THE BUTTER INDUSTRY OF NEW ZEALAND.

All who are interested in the dairying business in this State will read with interest a report by Mr. Ferguson, surveyor to the Meat and Dairy Produce Board, in which he deals with various facts in the report of the Department of Agriculture of New Zealand, compiled and submitted by Mr. J. A. Kinsella, Dairy Commissioner.

Mr. Ferguson writes:—"When looking over the New Zealand report, and especially that portion of it compiled and submitted by Mr. J. A. Kinsella, Dairy Commissioner, I was surprised at the magnitude the industry has attained, and the very superior quality of the products manufactured, the butter competing successfully with the Danish, and has realised up to 116s. per cwt. during last season. The total quantity of butter and cheese exported last season was 294,498 cwt., the value of same being £1,140,747, exceeding the value of the exports of the previous year by £101,704."

With regard to the quality of the New Zealand products, Mr. Kinsella writes as follows:—

"In my last year's report I was able to speak favourably on the quality of our produce. This year I have to report a further great advance in the way of raising the standard of a large number of our secondary brands of both butter and cheese, and also an all-round improvement in quality, such as probably no other country has experienced in one year.

"Three years ago, New Zealand factories were obtaining from 12s. to 14s. less than the Danish. On various occasions in London this season, our best brands were bringing prices very close to those obtained by the Danes, and, in some instances equal prices were obtained.

Mr. Kinsella attributes the success of the New Zealand factories in producing the present high quality of butter and cheese to improvements in factory buildings and plant generally, efficient drainage, and the effective disposal of sewage, rendering the sanitary condition of the premises suitable for the purpose. Secondly, to the fact that skimming stations or creameries have been established in every dairying district in the colony, the cream being received at the factory in the best condition for manufacture in consequence. Thirdly, to more efficient management in the factory, owing to the practical instruction given the managers by the experts of the Department; also to the grading of the butter at the several ports of shipment, and holding same, where possible, from the factory storeroom to London in a frozen condition.

The Dairy Commissioner, when writing of butter factories, says the buildings should be of a substantial character, and sufficiently large to permit of the addition of extra plant when required. All butter-working and cream-ripening rooms should be airy and well-lighted and ventilated.

The walls outside should be weatherboarded, and lined with matched timber inside, and finished with paint of a light colour to prevent the wood from becoming musty.

Mr. Kinsella states that "Last season, this division supplied plans and tendered general advice on sound lines to many people starting co-operative companies in new districts, but I regret to report that in a few instances such advice was not followed, as, in preference, changes were made which were suggested by agents of factory appliances, architects, and newly-appointed and sometimes inexperienced managers.

"This resulted in such factories being badly planned, while the arrangement of the plant was sometimes such as to almost render the whole factory unworkable, and the necessary replacement and changes subsequently made added considerable extra expense to the newly-formed company."

Reporting on cleanliness in connection with dairy factories and skimming stations, Mr. Kinsella says:—

"I cannot impress too strongly upon all factory and skimming station managers the importance of paying strict attention to cleanliness in every detail, as this is one of the strongest factors in the production of a fine-flavoured article. Speaking generally, this matter is fairly well attended to in most of our best factories, and there is no doubt that factory managers deserve a word of praise for the marked improvement which has taken place in this direction during the last two or three years, recognising that the sanitary conditions existing in the factory buildings and surroundings have a close connection with the quality of the manufactured article."

The New Zealand Dairy Commissioner, after visiting the Commonwealth States, reports as follows upon the matter of the home separation of cream:—

"After careful observation at many of the best factories in New South Wales and Victoria, I am now in a position to speak on the question of home separation, and I feel it my duty to condemn this system for the manufacture of export butter in much stronger terms than I have already done to the producers in this colony.

"I would also impress upon those who intend to engage in the industry in the newer dairying districts, and who are contemplating starting factories, the importance of commencing all new business on the skimming station system.

"In many parts of New South Wales and Victoria the cream arrives at the factory in such an advanced stage of ripeness that, in my mind, it is impossible to treat it scientifically so as to be able to make a sound keeping butter.

"When a factory has an output of 5 tons per day, and the cream is being received from several hundred suppliers, it follows that there must be a great many different qualities of cream at all stages of ripeness. At some of the large factories that I visited the cream on arrival at the factory was found to contain so much acid—or, in other words, the ripening process had advanced so far—that it was necessary to chill it down immediately for churning.

"With these conditions existing in the Commonwealth, I think that it is almost impossible for them to expect much improvement unless they remedy the original cause of trouble.

"So long as the raw material comes in in a bad condition, no matter how scientifically it is handled it cannot be manufactured into a good flavoured or sound keeping butter.

"My advice to the people in this colony who are starting new companies is to make sure to get started on a right basis, and they will then be certain to meet with success.

"In many of the districts of New South Wales and Victoria they are dairying practically under the same conditions as we are here, and there is no reason why the skimming station system should not be adopted and carried out successfully there."

This report of the Dairying Division of the Agricultural Department of New Zealand, compiled by the Dairy Commissioner, Mr. Kinsella, is a most valuable treatise upon the science and art of manufacturing a high-grade quality of both butter and cheese, and if printed and circulated in every dairying district in this State by this Department, I am confident that the industry

would be immensely benefited, by creameries being again established, co-operative dairying stimulated, and a better quality of butter and cheese manufactured.

LONDON WHOLESALE PRICES OF BUTTER.

Country of Origin.	Week to 9th February, 1903.		To 13th February, 1903.	
	Choicest cwt.	Finest cwt.	Choicest cwt.	Finest cwt.
Danish and Sweedish	110s. to 112s.	104s. to 108s.	108s. to 110s.	106s. to 108s.
Victorian	100s. to 104s.	Not quoted	98s. to 100s.	Not quoted
New South Wales	Not quoted	" "	Not quoted	" "
South Australia	" "	" "	" "	" "
Canadian	" "	92s. to 94s.	" "	92s. to 94s.
Normandy	110s. to 114s.	102s. to 106s.		
Russian	94s. to 98s.	90s. to 92s.		
New Zealand	102s. to 104s.	98s. to 100s.	98s. to 100s.	94s. to 96s.

		cwt.	cwt.
Copenhagen official quotations, 5th February, choicest,		105s. 6d. ; finest,	103s.
" "	6th "	108s. ;	" 103s. 6d.
" "	12th "	103s. ;	" 101s.
" "	13th "	112s. ;	" 110s.

THE DAIRYING INDUSTRY IN RUSSIA.

[Notes of a conversation between an officer of the Queensland Department of Agriculture and Mr. Nicholas Krukoff (the representative of the Russian Minister for Agriculture), who visited Queensland last month.]

What are the best breeds of dairy cattle in Russia? We have three very good breeds from Switzerland—the Simmenthal, the Algau, and the Switz. These are from North Switzerland, and they are very good cattle, especially for mountainous country. The Simmenthal is good for both dairying and beef purposes, but the Algau and Switz are more exclusively dairying breeds.

You feed them mainly on the natural grasses? Yes.

And on hay made from the natural grasses? Certainly.

Do you have silos? They have just been introduced there, but there are difficulties attending the adoption of the silo system in Russia, chiefly owing to the heavy frost experienced. You cannot build silos underground there. You must protect them as far as possible from the severe frosts. We have frosts 90 degrees below your zero, so you can understand what that means.

You have no herbage in winter? No. It is snow everywhere.

Even in the south, about the Black Sea? Yes. Practically everywhere. In the south, of course, the winter is shorter. Our season is from March to October—that is, spring, summer, and autumn all lumped together. All farmers must have sufficient food to keep their cattle, horses, and sheep during the cold season.

Do you keep cattle under cover at night? Always. We build special houses. We have stables for both cattle and sheep. You could not keep them in the open air, although you can do so in the extreme south of Russia.

How many cows would a small farmer keep? A peasant keeps from one to three.

Do they sell the milk? Yes. They sell to creameries. Just now the number of creameries is increasing largely.

Has every peasant a separator? No.

How do they separate their cream? They sell their milk to the creameries.

In Queensland they carry the cream. In Russia and in Denmark the farmers bring the milk to the creamery and receive the skim milk back immediately. This is used for pigs and calves and young stock generally.

What encouragement does the Russian Government give these men? First of all, we established an institute of experts. We have now about a hundred experts connected with the institute.

Are there a hundred dairy-experts? Yes. Even more. They are sent all over the place.

Have you a travelling dairy? Yes, sometimes. Or we will establish a permanent dairy in a certain place. Then lectures are given, and sometimes we give help to small farmers to build creameries.

Not to one man? Yes, sometimes to one man. We give money at a low rate of interest.

You lend money? We lend money at low rates of interest.

Have you a farmers' bank? We have several banks. They are not exactly farmers' banks. We have special banks.

Do they belong to the State? Yes. There are special mortgage banks. There are banks for the nobility, for the peasantry. There are agricultural banks to lend certain sums for amelioration, for certain purposes only. For instance, if anybody wishes to establish a butter factory or a cheese factory, or a vineyard, requiring a certain amount of capital, he can get it from the Department of Agriculture at a low rate of interest. The security must be his own land.

What about a man who rents land? Private banks could lend to him.

But not the State? No.

Have they got any agricultural societies in Russia? There are a good many. They get support, but they do not all work too well. Most of them are very idle. There are from 100 to 200 societies in Russia, and about 20 of them may be considered active.

Are they all supported by the State? They are supported if the Government considers them sufficiently active. To be considered active, they would have to organise meetings, publish journals, hold lectures, organise shows. As soon as they organise meetings, especially in the winter, they apply to the Government, which is always pleased to help them. To a sleepy society of course the Government renders no assistance. In general, it may be said the Government seldom refuses assistance to a society that asks for help. If a society wishes to get up a show, and has not sufficient funds, the Government will give it a subsidy. The Government will offer prizes for stock, and in other ways assist the proposed show.

Have you a system of dairy inspection in Russia? Yes. We have the institute of experts.

I mean for sanitary purposes? Yes. They see that everything is kept in a cleanly way.

You insist on cleanliness? Yes. We are not allowed to put preservatives in our butter. That is strictly prohibited. In Victoria and New South Wales they are allowed to put in $\frac{1}{2}$ per cent., but how are you going to control the amount? In Victoria, cream may get sour, and then preservatives are stuck in to get it right. In Russia boracic acid, salicylic acid, and all such preservatives are prohibited.

Do you use all the butter in Russia, or do you export any? We both use it ourselves and export.

Where does the surplus go to? To England—Glasgow, London, and other ports.

Is there a bonus on export? No. But the Government see that the producers get cheap rates of carriage for the butter.

Have you refrigerated steamers? Yes. Refrigerated steamers and railway cars.

What is your butter port? Liebau, on the Baltic Sea. The Government renders assistance in the matter of cheap carriage from the place of production, say Siberia, to the port of export. No direct financial assistance is rendered in the matter of the oversea carriage of the butter from Russian ports to England,

although the Government have arranged with the shipping companies for regular sailings. Steamers with butter leave Liebau three times a week. We also ship butter from both Riga and St. Petersburg.

Any from the Black Sea ports? No. The handiest port is Liebau. Siberia is the principal source of supply of our butter.

Would it not be cheaper to carry your butter by water? No. There is too much ice in the way.

Do you know the rates of freight? The total cost of freight from Siberia to London is 1 rouble for 1 pood, or, expressed in English money and weights, slightly less than 26d. for 36 lb. of butter.

How do you pack it? In casks or barrels of 1 cwt.—the Danish system.

Will it keep well in casks? Yes.

Which do you prefer, the casks or boxes? The box is the better.

The French butter is in baskets? The French butter is only a few hours in transit. But for very long journeys you must have something stronger.

You prefer the Australian box system? Yes. It seems much better.

Does the Government make any arrangements for the sale of Russian butter in London? No. That is left entirely to private enterprise. We help in the production and transportation.

What does your butter fetch in the London market? Our butter now is very low.

Butters are considered better than Russian? The best butter is the Danish. Then comes the Irish, and then the Australian and New Zealand. After that, Russian. In the central part of Russia, north of Moscow, we make very good butter. In Siberia the butter is made in greater quantity, but the quality is inferior. They receive 92s., 93s., 94s., 95s., and 96s. per cwt. for their butter. The hundredweight is the English 112 lb. generally adopted in that kind of trade.

Things are improving? Certainly. But improvement in some respects is difficult with our people, as many of them are very ignorant.

Where do you get your experts from? They are all Russian. But we imported our first teachers from Denmark. We invited 20 young men, who were sent to the northern part of Moscow to introduce the business. Some were afterwards transferred to Siberia. Our first teachers were Danish experts, but since then Russian young men have learned the business.

Do you think the superiority of Danish butter depends on the Danish cows? Oh, no. Entirely on the processes of manufacture.

Not on the Danish grasses? There is nothing special in the Danish grasses. They have the usual timothy, cocksfoot, and other grasses generally used in Europe. The secret of their success is the strict cleanliness and attention to detail observed in the manufacture from the very start to the finish. Butter is a most delicate product.

What are the tests of good butter? Cannot you produce a good colour artificially? Artificial colouring is put in, but it is only to satisfy the demands of the market. The colour of the butter means nothing, and the demand of the consumer for a rich colour is all nonsense. The market, however, may require such-and-such a colour, and the producer of course has to gratify it. A little artificial colouring is, therefore, used to meet the wishes of the public, and also to give the butter a uniform colour. The colouring matter used in Russia is obtained from Denmark, but it is only used in butter intended for export. Butter intended for home use is never artificially coloured. Of course, the colour of the butter largely depends upon the grasses eaten by the cows. In May the butter is yellow, but as autumn approaches, and the grasses get drier, the butter gets whiter.

Do you allow consumptives about a dairy? It is not allowed. We keep them out of the dairies.

Do you license your dairies? No.

How do you deal with a man who breaks the law? We have inspectors.

If a man breaks the law, do you prevent him from continuing to run his dairy? Yes. We apply to a justice of the peace, and he can order the dairy to be closed. We can deal with him under the health laws.

I suppose you see a lot to condemn in our system? Yes.

And some you see worthy of adoption? Yes. The system of collecting cream from creameries and producing the butter in one centre is very good, because you are able to produce an equal grade of butter. For the international market it is important to have an even grade of butter. One of the reasons for the comparative inferiority of the Siberian butter is because it is largely produced by individuals in small quantities. A man will make half-a-cask one day and make another half-cask the next, and add the two together. Such a system, especially when the amount manufactured is even under half-a-cask, is of course against a uniform quality of butter.

Are they making a good living? They are not entirely dependent upon dairying, but it is a great help to them. It is an important adjunct now that the great Siberian Railway has been built.

What about China as a market for Siberian butter? In China, the only consumers of butter are the European population, so of course there is not a very big market there. There is, however, a certain demand for butter in 1 and 2 lb. tins.

ESTEEM OF THE ANCIENTS FOR AGRICULTURE.

By the laws laid down by Zoroaster, the prophet of the Persian religion, every devout Persian was enjoined to plant useful trees, to destroy noxious animals, to convey waters for irrigating the fields, and to work out his salvation by pursuing all the labours of agriculture. A wise and benevolent maxim of the Persians was: "He who sows the ground with care and diligence acquires a greater stock of religious merit than he could gain by the repetition of 10,000 prayers. In the spring of the year a festival was celebrated to represent the primitive equality, and the stately kings of Persia, exchanging their vain pomp for more genuine greatness, freely mingled with the humblest but most useful of their subjects. On that day the husbandmen were admitted, without distinction, to the table of the king. The monarch accepted their petitions, inquired into their grievances, and conversed with them on the most equal terms. "From your labours," he was accustomed to say, "we receive our subsistence. You derive your tranquillity from our vigilance: since, therefore, we are mutually necessary to each other, let us live together like brothers in concord and love."

King Artaxerxes said, "The authority of the prince must be defended by a military force; that force can only be maintained by taxes; all taxes must at last fall upon agriculture, and agriculture can never flourish except under the protection of justice and moderation. Alphonse Koir says:—"Man is born an agriculturist; and it is both bad morality and bad policy to invite him, by fortune or by honours—in other words, by avarice or by ambition—to leave the plough and the fields. It is a mistaken idea to give education to the children of peasants only to make them come out of their sphere. No one is too learned to be an agriculturist, hardly anyone is learned enough for it."

Poultry.

REARING POULTRY.

The *Australian Farm and Home* has the following useful rules, taken from an article by Professor Cook, in the *California Cultivator*, which are as applicable to Queensland as to America:—

AIR AND CLEANLINESS IN THE POULTRY YARD.

Eggs or no eggs, that's the question. In many cases it's no eggs, and for long periods when there ought to be eggs in profusion. There are two good and sufficient reasons for this scarcity, and a third reason may well keep the others company. The first and most important is want of neatness. Filth is the great breeder of vermin and microbes, but neither vermin nor microbes are breeders of eggs. The poultry-house ought always to be fresh, clean, and neat. Such a condition means eggs.

Again, we all need the freshest, purest air to do our best. The whole bird class are especially susceptible to lack in this respect. They not only breathe with their ample lungs, but to the very tips of their bones. The bones are all hollow, have tubular connection with the lungs, and so we may say truly that the bird breathes not only with its lungs, but with its entire skeleton as well. Nature meant that the bird should lay a full quota of eggs. To do this she must have a great supply of purest air. Nature has provided for this.

If we house our birds in small, dirty, ill-ventilated houses or roosts, we interfere with Nature's plan, and we deserve to get no eggs. A close third in importance, or so say some, is avoidance of draughts. Roup, or a hard cold, has set her fiat against eggs in the larder. True, chickens in the trees all night, where draughts are at their best, rarely have roup. But how clean the trees, how pure the air. In the house, dirt and impure air enfeeble the bird, and she readily becomes the victim to small trials. Were it bad air or draughts, I would say draughts, but as neither are necessary I would avoid both.

Lice make hot weather doubly bad for fowls. Use killers freely. Kerosene and whitewash the roosts and houses frequently.

SIMPLE RULES FOR THE CARE OF POULTRY.

1. Keep clean. This refers to drinking water, food, houses, nests, drop-boards, roosts, yards, &c., and the fowls themselves.
2. Keep dry. Dampness means sickness. If houses and yards have not good, quick, natural drainage, put in drains.
3. Keep fowls comfortably housed. Avoid draughts, but don't be afraid of ventilation. Furnish plenty of shade in summer.
4. Don't crowd. Consider 5 square feet per head in house, and 50 square feet in runs the smallest space practical for continual use. Double it if you can.
5. Keep free from vermin. Frequent whitewashing and liquid lice-killer for building and roost and insect powder and dust baths for fowls will do it.
6. Feed regularly several times a day and in as great a variety as practical. In addition to grains, supply green and animal food in some form. Make fowls hustle for a part of their living by throwing the grain in a litter, where they must scratch for it. They need the exercise.
7. Always keep grit and lime in some form before them; the quantity they use is surprising.
8. Always keep fresh, clean water before them.
9. If a bird is sick, promptly separate it from the rest.

WHO IS TO BLAME.

The poultry-keeper that fails to make money with his fowls often asserts that his birds were to blame. Usually he says that there is no money in poultry, any way. Seldom is he willing to admit that his failure was due to himself alone. Yet such is about always the case. A man fails because he does not know enough to succeed. That is the one great cause of failure. The antidote is to know more. This knowledge must come both by experience and study. There are some people that never could learn enough to succeed with poultry, because they are lazy, and refuse to busy themselves about details. Some people take to the culture of poultry thinking it to be a lazy way of getting a living. Never did they make a greater mistake.

STRENGTH OF ANCESTRY.

To have a strong breed of fowls we must have birds bred up from strong ancestors. In our present knowledge of the different breeds we cannot tell just what the comparisons between the different breeds are in this respect. Doubtless as time goes on we will have tests to discover these relative facts. There is a strong impression that one breed is much stronger than another breed, but we have no definite data to back up these rather vague impressions.

In a small way we can tell something about the strength of ancestry in individual strains. Thus, if we have had in our flocks rather weak birds and have permitted them to reproduce themselves and have seen the same weakness in their progeny, we know that the proper strength is lacking for the development of a proper strain of valuable birds. The best we can do is to watch these birds and weed them out of the flock. If we cure a sick bird, that bird should never again be permitted to lay eggs for hatching purposes. The very fact that she has been sick makes it probable that she lacks in hardiness.

WATER FOR POULTRY.

A frequently changed supply of clean, fresh water is of first importance at all times, and the closest attention is required during the hot months. Metal receptacles of any sort preclude the use of Douglas mixture, or sulphate of iron, in the drinking water. The cheapest and most suitable water vessel is a flower pot, 8 inches in diameter, or even less. Plug the drainage hole with a cork. Sink the pot a few inches in the ground to prevent it being upset by the birds. You can clean these pots easily, and if they become foul, placing them over a slow fire for a few minutes will cleanse them. They are cheap, and keep the water cool, and you have no metallic action if you use sulphate of iron. The drinking water must be kept as cool as possible, and always in the shade. The shelter for this purpose may be small and neatly made of thatch, &c., say 3 feet x 2 feet, which will also allow space for a shallow tin or trough containing a supply of hard, sharp grit, and also one containing shell, old mortar, old crushed bone, charcoal, &c. These should be looked to at intervals, and be frequently renewed.

KEEPING LARGE NUMBERS.

With a flock of ten or twenty hens the poultry-man has an opportunity of giving daily attention, and if anything goes wrong it is quickly noticed; but when large flocks are kept the matter of having them always in proper condition is one of anxiety. In order to give all his attention the number of hens kept must be sufficient to remunerate the poultry-man for his labour. If this is not done, there will be no profit. If the number is too small the labour will be too large an item, and failure will be the result. It is on this point that a majority of failures occur. It may be safely stated that 500 hens will support a moderate family, and there are few persons who keep more than that number; but, like any other occupation, the expenses must be taken out, and whether the expenses are too great or not depends upon the extent of the operation.

Many make the mistake of endeavouring to keep too many fowls together, thus not only inviting disease, but, more frequently, lice. When lice make

their appearance in a large flock of several hundred it is usually an end of the enterprise, as the labour is at once doubled. By beginning with clean premises, and cleaning them daily, as is done with stables, much difficulty may be avoided. Large flocks may be kept as easily as small ones if divided into families, and attention and vigilance bestowed.

HENS FOR SITTERS.

The best hens for sitters are those that are active and of medium size. A clumsy hen should not be used. Small hens also make usually excellent layers, as they do not become fat so readily. As long as a hen is laying regularly there is but little liability of her becoming too fat, as the production of eggs demands all the nutriment of the food; but such foods should not consist largely of corn-meal. As soon as a hen ceases to lay she will become fat, and the feed should then consist principally of grass and meat, with grain at night. Hens that are too small can fly over tall fences, while those too large are clumsy, the best for general purposes being of medium size.

SIZE OF FLOCKS.

What should be the size of a flock of hens? Some answer by saying fifty. Some would keep a hundred or more in a flock, and from foreign countries come reports of thousands being kept together with no effect to sub-divide. However, we do not know what disasters come to those flocks as a result of such management. We notice that in this country the most progressive poultry-men incline toward small flocks. Where large flocks are kept it is necessary to build long, narrow houses, but it is probably the only way to succeed. Diseases spread very rapidly in a large flock when they once get started. Where hundreds are kept together the danger and loss from this cause become very great. To keep the birds in good health only few should be kept together. There are men that perhaps could manage large flocks and keep them healthy, but the ordinary man cannot be depended on to give the attention to a flock necessary to bring such results.

WASTE IN FEEDING.

Care in feeding avoids waste of food. Frequently a large waste occurs when the food is thrown on the ground. The hens trample more than they eat, and then refuse it. This frequent and constant trampling of the food causes the ground to become contaminated, as well as rendering it a breeding-place for disease. There is no necessity for throwing the food on the ground to be wasted. A clean board is better, and in feeding one should endeavour to give no more than will be eaten up clean. Soft food is more easily wasted than whole grain, as the birds will hunt for that left over; and to avoid loss the soft food should not be too wet. Whole grains should be scattered over a large surface.

THE HEN'S TOILET.

The dust-bath is to the fowl what the wash-tub is to the individual. With the dust-bath the hen cleans her body. She uses it also for exercise. When a hen is incubating she comes off as regularly to dust herself as to feed, instinct teaching her that it is the best of methods for ridding herself of lice. Dust is cheap, and should be used plentifully.

DO NOT MARKET BAD EGGS.

Every farmer that sends or takes eggs to market should test or candle his eggs before disposing of them. This will prevent putting on the market bad eggs. There are many ways of candling them. One of these ways is to roll up a piece of heavy paper into the form of a tube. Place an egg in one end, and permit the light of the sun or of a lamp to shine through the egg. The eye at one end of the tube will be able to see through the egg and determine the condition of its contents. If the contents of the egg appear cloudy or blurred the egg is not fit to go to market. Good eggs present to the eye contents that are clear and translucent.

Bad eggs depress the market. After people have got hold of one or two bad eggs they turn to other kinds of food, and cease to buy eggs. If only good eggs were sold at all seasons the consumption of eggs would be enormously increased. Especially if the farmer have private customers is it foolish to market eggs that have not been candled. There is nothing that will build up private custom like always giving absolutely perfect eggs, and there is nothing that will so quickly destroy a private trade as a few bad eggs scattered through the lots sold. Guesswork need not enter into this matter, as candling is entirely feasible, and can be rapidly performed.

SHADELESS YARDS.

Shade must be provided for the fowls and chicks if they are expected to thrive. Fowls suffer greatly from cold in winter, but not so much as they do from heat in summer if compelled to be under the sun's rays all the time. Farmers usually let their fowls run at large, and in that case they can always find plenty of shade; but in a shadeless yard, in which the fowls may be confined, they suffer greatly on very warm days.

The poultry-man that does not provide his birds with a good pasture or supply them with green food cannot expect to succeed, and he will not. Poultry require green food, must have it, or they will not do their best; no difference how choice your birds may be, unless they have the green food they will disappoint you.

MORE ROOM FOR IMPROVEMENT.

There are but few who devote their whole time exclusively to poultry, and yet the enormous product of eggs and poultry is due to what may be justly called the extra periods of labour. Yet, small as is the attention given poultry, the value of such is very great. There is no reason, however, why a fair income may not be derived by devoting the whole time to poultry. It is done profitably in France, and there are establishments in England where hundreds of hens are kept and many thousands of dollars invested. The difference is that but few are educated to a knowledge of the characteristics of the breeds and the proper mode of management. As our country is large, there is a great diversity of soil and climate, and the people of each section must learn the proper conditions for success. There are a few large poultry-farms in America, but there is room for many. That poultry can be made a business has been demonstrated at several points; but success has generally attended those who sold poultry and eggs, at the same time taking advantage of the high prices for early chicks.

GUARDING AGAINST CONTAGION.

No one should keep a bird after it comes from another place if it shows indication of disease, as there is no knowing the nature of the disease until it fully develops, and then it may be too late if it is of a contagious character. Some birds are "immunes," and escape all diseases, while others are easily affected. No bird is exempt, but there are some families among all breeds that are harder than others. Inbreeding, overfeeding, and exposure will affect the breeds. Roup has been known to prevail in yards in which certain families quickly succumb, while other birds that roosted, ate and drank with them, showed no signs of the disease. A bird may have the roup sometimes, spread the disease, live to an old age, be apparently well and vigorous, and yet cause the death of many others that are more easily affected by the disease.

Meat in the rations stimulates the hens to lay freely.

BREEDS AND PROFIT.

There is as much difference in the keeping of the several breeds of fowls as in the keeping of larger livestock. If one makes a specialty of rearing poultry for market, the weights should be as heavy as possible, as the sales are made by the pound; but if eggs are to be depended on as contributing a portion of the profits, then weight must not be

considered. It is no disadvantage to have a large, heavy, laying-hen if weight and egg-production can be combined, but as a rule the very heavy hens are not the best layers. With larger stock there are special beef-breeds, while others are intended for milk. These characteristics are, of course, impossible with birds; but, nevertheless, there are breeds that excel in egg production, while others readily convert food into flesh. The poultry-man who contemplates the management of a poultry establishment should have a definite purpose in view, and in the beginning select those breeds which best conform to his requirements, as any mistake made occasions the loss of at least one year's time. Hence, do not aim for heavy fowls unless you intend to make a specialty of weight. The different breeds all have their peculiar characteristics.

DUST BATHS.

Poultry delight in a dust bath. In a sheltered and rainproof position, make a depression in the ground, and fill with road dust or dry pulverised earth, to which add a proportion of wood ashes and a handful of flowers of sulphur; keep dry, and pass the materials through a sieve occasionally. The birds will rid themselves of any vermin, and during the moult the casting of old feathers and the growth of the new plumage will be assisted.

Eggs are best kept lying in a normal position on all their sides. This holds good whether you are keeping them for table use or for hatching purposes. Besides, they should be turned, or shifting them daily from one basket to another will suffice. Baskets are superior to either tin or earthenware dishes—in fact, experiments have fully demonstrated that few eggs will hatch after a week or ten days in a cold, clammy earthenware dish.

Cull rigidly. Always be on the lookout for the poorest specimens of birds, and get rid of them as soon as found and as fast as found. To permit the culls to go right on producing more culls, or what should be culls, is a mistake. The best thing to do with culls is to send them to the butcher, and if there is danger of his selling them for breeders send them to him dressed.

LUMPY FEET OF POULTRY.

A correspondent says that he has a hen with a swelling in the leg where the toes join. This swelling starts behind the little toe, then the others all swell, till there is a lump, and the birds are unable to put the foot down, and after a time they die.

We referred the matter to Mr. Hindes, poultry expert at the Queensland Agricultural College, and he suggests the following causes of the injury, and gives the remedy. The fowls, he says, appear to be suffering from an abscess, possibly caused by a corn under the foot, brought about by roosting on high perches and hurting themselves when flying down; or a rough, stony yard will cause the trouble in the case of heavy breeds. The corn presses the foot and causes the abscess. If the lump is on the top of the foot, between the toes (something like a red cherry), cut the skin in the shape of a cross, and squeeze the lump out, dressing the wound with carbolic vaseline or boric acid ointment. Should the lump be under the foot, cut off the hard surface and poultice; when ripe, let the matter out, and wash with Condy's fluid; then use the vaseline as before. It is not a disease.

THE RAISING OF CAPONS.

As the farmer sees a profit in steering the calves and barrowing the pigs, so does the poultry-raiser, looking for a means to utilise every source of profit to add to his income, and increase the general results of his endeavour, traverse the natural and caponise the cockerel (says the *Fanciers' Gazette*). By this

avenue the successful and enterprising poultry-raiser is endeavouring to reach a new and fertile field of profit. Cockerels predominate usually in the hatches. As they magnify as a nuisance, the capacity for consuming grows apace, and when grown they have cost more than they come to.

By the introduction of caponising all this trouble ceases, and the mischief-making cockerel is transformed into a tranquil, majestic fowl, moving at leisure about the yard, and only growing fatter and heavier every day. Instead of chasing about, making a disturbance, he is adding pounds where he added ounces in his former state, and is becoming more and more in the market the rival of the turkey in weight and quality of flesh; and as a seller he is the peer of any fowl yielding the greatest returns to the poultry-raiser, having been thus changed by a process so simple that a boy of 12 years of age, equipped with a set of these instruments, can perform it with safety and thoroughness.

Each year demonstrates the truth more forcibly that the introduction of caponising will increase to an unheard-of degree the profit of the business. But a few years ago caponising was scarcely practised in the United States at all. Now it has assumed enormous proportions, and is growing with a rapidity that surpasses the most sanguine conjectures of its friends. For many years the "Philadelphia capon" was the only capon known to commerce. Now, the Western capon is coming steadily up abreast, and is contending for first place.

That this field in poultry culture is just being opened is plain to everyone. It is a fact that no other fowl will take their place, and they have a field distinctly their own, and this they will keep as long as time lasts. In the race for public favour, the ordinary fowl has no show with the capon.

[For methods of caponising cockerels, our readers are referred to the following volumes of this *Journal*:—Vol. VI., pp. 25, 281; Vol. VII., p. 144; Vol. IX., p. 583.—Ed. *Q.A.J.*]

POTATO SALAD.

This excellent dish is not often seen on British or Australian tables, yet if well made is a most appetising accompaniment to a cold meat meal. The German and French excel in the art of making up cold potatoes into a variety of good dishes, and amongst them the potato salad takes a prominent place. Here is a good recipe we find in an exchange:—

Heat a cup of good vinegar, and when boiling add to it, stirring briskly to prevent lumps, one beaten egg, one teaspoonful dry mustard, one-fourth teaspoonful salt, one teaspoonful flour, which have been stirred together with a little milk until smooth. Beat well, adding butter size of a small egg, more or less as desired. Set this dressing away to become cold. It will keep a long time if required.

Boil hard three or four eggs. Remove shells, and slice when ready to prepare the salad.

Slice or cut into $\frac{1}{2}$ -inch cubes a sufficient amount of cold boiled potatoes. Chop or slice fine one onion, good size. When wanted mix sliced eggs, potatoes, and onion, and pour over them the dressing. Stir only enough to incorporate all well together, and serve very cold. A nice accompaniment for cold meats.

In Germany the potatoes are often left overnight after slicing to steep in vinegar.

The Orchard.

PINEAPPLE CULTURE.

By ALBERT H. BENSON.

PART III.

PERMANENCE OF PLANTATIONS AND REPLANTING.

The permanence of the plantation depends largely on the method of planting adopted. Where the ordinary methods of planting—viz., single or double rows, as described in Part II.—are in vogue, the life of the plantation is usually a long one, as the plants are allowed to grow till they occupy the whole of the ground, or, in some instances, till two adjacent beds join and form one mass of plants some 16 feet wide. In the older pineapple-growing districts some of these beds are over 30 years old, counting from the time that the original plants were planted, and although they still continue to produce good fruit on the outsides of the beds, that produced in the centre is often undersized and hard to gather. In my opinion it is inadvisable to allow the plantation to remain too long without replanting, as the centre of the rows becomes exhausted and worn out, due not so much to the age of the plants as to the impossibility of working the soil around them, and the difficulty of manuring. The soil becomes gradually harder and harder, and the roots come closer and closer to the surface, being drawn thither by the surface manuring, as well as being forced upwards by the increasing hardness of the soil.

In order to get over this, when two adjacent rows join, forming a mass of pines some 16 feet or so wide, it is a common practice to dig out the centre of each row, says 4 feet in width, the part removed consisting of the suckers originally planted and the ratoons immediately surrounding such plants; the younger ratoons on the outside of both rows being allowed to remain and form the new row, the centre of which will be exactly midway between the rows originally planted. The ground from which the pines are dug up should then be thoroughly worked by hand, being spaded or forked to a depth of 14 inches or more, and should be well manured. This will give new life to the plantation, as the youngest plants will now be in the centre of the new rows, and the rows will spread in width by ratooning into the land that has been well worked and manured.

It is not advisable to continue this method of renovation too far, as once the pines are found to be deteriorating after the rows have been renovated as described, it is, in my opinion, advisable to replant afresh; but, before doing so, to give the land a spell, so as to enable it to become thoroughly sweetened and renovated. When the plants are dug out the land should be well ploughed, and if possible subsoiled, and instead of allowing it to remain in bare fallow, I strongly recommend its being planted to a leguminous crop, such as peas or beans, for marketing, or, better still, for ploughing in as a green manure. Such a leguminous crop should receive a heavy manuring of phosphate and potash manure, such as a mixture of meatworks' manure and sulphate of potash, as this will tend to produce a heavy crop of peas or beans, and should same be returned to the soil as green manure, the land will have the benefit both of the increased amount of organic matter and nitrogen returned to the soil by the green manuring, as well as of the phosphoric acid and potash that was applied to produce such green manure. The soil will consequently receive a manuring of a complete fertilizer that is in a readily available form to be assimilated by the young pines when replanted on the soil.

Where the pineapple rows become badly infested with blady grass or couch grass, the only cure is replanting, care being taken to thoroughly clean the land first. I know no way of renovating the soil prior to replanting that is preferable to the growing and ploughing in of green manure, as, in the first place, the growing of a leguminous crop is a complete change for the soil, and as these crops are deep rooters, they tend to leave the soil in an excellent condition for the subsequent crop of pines besides adding materially to the fertility of the soil and materially increasing its organic contents and consequent capacity to retain moisture during a dry spell.

For the southern parts of the State I am of opinion that the black and clay-coloured cow pea, small Mauritius bean, and velvet bean will be found most valuable, and in the warmer parts the large Mauritius bean—either black, speckled, or yellowish—may also be used. Where pines are planted on the check system, as in Florida, replanting is advisable somewhat frequently. Mr. Robert Thomson, in a report made by him to the Jamaica Board of Agriculture on the cultivation of pineapples in Florida in 1901, states:—"From the period of planting the cultivation is kept up from 8 to 10 years. I noted that they passed their prime in 4 years, hence frequent replanting would be better." More frequent replanting, of course, adds somewhat to the cost of production, as time is lost thereby as well as the expense of the planting, but this is more than compensated for by the improvement in the size and quality of the fruit produced; besides which the land is never under crop long enough to become thoroughly set and hard, even though only surface cultivation has been carried out, as prior to each replanting the whole of the land is deeply and thoroughly worked.

CULTIVATION.

As in the case of other fruits, good cultivation is essential to the success of the pineapple plantation. The method of cultivation will depend on the way in which the land has been set out, as if the ordinary plan of planting in single or double rows has been carried out, then cultivation with horse power will be the best and cheapest; but, if planting in checks, unless very wide ones has been followed, then the whole of the work must be done by hand.

Where horse cultivation is used, the work should be done by means of a suitable plough used in conjunction with one or two horse cultivators of the Planet Junior type, so as to keep down all weed growth and to maintain a fine tilth. The working of the ground should be, to and not from the pines, taking care, however, not to hill up the pines too much, especially in free well-drained soils. Where the subsoil is somewhat retentive, a condition which I have already pointed out is not the best for their growth, it is advisable to hill up the pines somewhat, so that the dead furrow between the rows will tend to drain the beds and to carry off excessive surface moisture. In small plantations hand culture may be carried out, but it must be done thoroughly, and the land right up to the rows should be well forked over at least once a year. Such a forking over, if done during winter or early spring prior to the summer growth of the pines, will do a great deal of good, especially if a good coating of manure be forked in, as it leaves the land right up to the plants in a good condition to promote root growth and strong ratoons, as well as to produce strong-bearing suckers. Hand culture near the plants is preferable to horse culture, in that it can be more thoroughly and carefully done, and there is less likely to be any damage to the plants by the bruising or breaking of the leaves as is bound to be the case when the horse is worked right up to the plants. When the plants are young hand weeding is necessary in the row itself, but once the rows close up this is no longer necessary—the working of the land between the rows being all that is required. When planted in checks, if the checks are wide, say 3 feet by 3 feet to 4 feet by 4 feet, the Planet Junior, or similar horse-hoe, can be used whilst the plants are young, but once they begin to close up horse cultivation is out of the question. When the checks are closer together than the distances mentioned the only culture possible is by hand, and the best implement is a strong Dutch

hoe, with which to keep down weed growth and to keep the surface of the land stirred. The pines, however, soon occupy the whole of the ground and so keep down weed growth. Thorough cultivation during growth is not so essential in free sandy soils as in soils of a heavier texture, hence check planting is better adapted to the former and row planting to the latter class of soils. Whilst speaking of cultivation, it will be as well to deal with the question of thinning out overcrowded beds, as unless this is done, the suckers become so numerous as to become weak and spindly, and consequently unable to produce fine fruit. Where not required for replanting, all gill sprouts or robbers should be removed from the pines, and once a sucker has produced a pine, the old stump or that portion of the stump above a strong sucker that has been left to take the place of the former sucker, should be removed. A judicious thinning out of suckers is advisable, those left to bear fruit being the strongest and healthiest and evenly distributed. This thinning out is best done in winter, and the suckers so removed are available for the spring planting, which, as already stated, is preferred by many of our oldest pioneers. The plan adopted in Florida, according to Mr. Thomson, is to leave two suckers to each plant for the second and subsequent crops, and even this forms a dense mass of growth yielding up to as high as 15,000 pines per acre. This is a large return and equal to that produced by our oldest plantations of rough leaves or common Queen.

SHELTER.

The question of shelter is one that our growers have so far given little attention to, as, with the exception of covering any exposed fruits, and sometimes the plants generally, with a little dried grass during the winter, nothing is done to protect the pine either from the summer sun or winter cold. The former is responsible for more or less loss by sunburning, especially of leaning pines; and though frosts sufficient to do any great harm are practically unknown in our pineapple-growing districts, yet the cold spells have a decidedly injurious effect on the strength of the plant and on the quality of the fruit. Our winter crop of pines is decidedly inferior in flavour to the summer crop, besides being more liable to disease—particularly black heart and fruitlet core-rot, described and illustrated by Mr. Henry Tryon, the Government Entomologist, in the December number of the *Queensland Agricultural Journal* for 1898.

Evenness of temperature is essential to the production of the finest flavoured pines, and this is recognised in all English pineries, where the fruit is grown under artificial conditions; and this evenness of temperature, artificially maintained, is responsible for the extreme quality of hot-house pines. The difference in temperature between the mid-day heat and the comparatively cold nights of winter is responsible for the poor quality of the bulk of our winter fruit, and the good quality of our summer fruit is due to our very even summer temperature. I am of opinion that the erection of light shelters will be found profitable in the southern pineapple-growing districts, as such shelters will tend to maintain a more even temperature, and will be a protection against sunburn and frost. Anything like the elaborate shed system now in common use in Florida is, however, out of the question at present, as in my opinion equally good results are likely to be obtained here by much less expensive structures, such as I have recommended in the "Orchard Notes" of the May number of the *Queensland Agricultural Journal* for 1902. In Florida, the heavy expense is warranted on account of the liability to total destruction of the crop by severe freezes, and, even leaving the danger of frost out of account, the experience of Florida growers tends to show that the improvement in the quality and quantity of the crop grown under sheds pays well for the extra expense.

Mr. Thomson, in his report, when speaking of the Florida shed system, states:—"In the Orlando district there are altogether about 200 acres of cultivation under sheds. Large extensions are made annually. The cost of erecting sheds per acre averages fully 300 dollars, and for the canvas as much more (£125 per acre). They last about 7 years."

Speaking of the Jensen district, Mr. Thomson further states:—"There is already about the same area of sheds as at Orlando, about 200 acres." Speaking of the results and advantages of the shed system of culture, the same writer states:—"The cultivation under sheds is a remarkable success—it is not only perfect garden cultivation, but it rivals the most skilfully conducted greenhouse cultivation. Nine thousand are planted to the acre; every plant, practically speaking, flourishes. . . . It is not uncommon to see a pinery with 95 per cent. bearing fruit. . . . It is found on a cold morning the sheds conserve the temperature to the extent of a few degrees. . . . The Red Spanish plants grow far more luxuriantly therein, the fruit is one-third larger, and it is decidedly improved in flavour, and the plants are cultivated with considerably less fertilising ingredients. Fruit-burning is also obviated. Careful observation of the open fields and of the shedded fields, side by side, conclusively prove the far great luxuriance and more perfect cultivation under the latter. The adoption of this system of cultivation is quite as important for the Red Spanish variety as it is for the smooth Cayenne. . . . Darkness during several months of winter at Orlando does not interfere with the perfect cultivation of the plant. Interrupted sunshine throughout the year by means of sheds for both varieties enhances the luxuriance, productiveness, size, and flavour of the fruit, and the cost of fertilising is materially reduced thereby. One great grower informed me that if he had from the first confined his attention to 10 acres of sheds he would have done better than by cultivating 60 acres in the open." Mr. Thomson sums up the advantages of shed culture as follows:—"It mitigates the fierce burning rays of a tropical sun upon plant life. It prevents continuous and excessive evaporation. It interrupts the force of wind which conduces to increased evaporation and aridity. Thus the whole mass of plants within creates atmospheric conditions of their own, conditions which are suffused throughout the shed."

Mr. Thomson's opinion is endorsed by Messrs. Webber and Rolfs, of the United States Department of Agriculture, and therefore deserves the very careful consideration of our pineapple-growers. Shed culture has proved a commercial success in Florida, and is to be introduced into Jamaica, where the conditions are more tropical than those of Southern Queensland, so that I am in favour of its being tested here in a cheap manner, in order to prove whether it is likely to be as profitable here as it has been in Florida. Such a test would settle the matter, as it would show whether there was money in it or not, and should it turn out a success it would be an easy matter to extend it on commercial lines.

GROWTH OF SUBSIDIARY CROPS BETWEEN PINES.

When planted in rows, a large amount of the ground is not required by the young plants, and the unused ground can be turned to account by planting it with crops that mature quickly and that do not interfere to any injurious extent with the pines. This planting of subsidiary crops is commonly practised in the older pineapple-growing districts, the principal crops grown being cucumbers for supplying the early local and southern markets, tomatoes, and occasionally cabbages and other vegetables. The land required for the growth of such crops requires to be well worked and thoroughly manured, so that the plant food required for the development of the pines is not depleted by the secondary crops to the extent of causing injury to the pines. Such crops, if well manured, do not do any appreciable injury to the pines, as they have a beneficial effect in two ways—one, that they tend to keep down injurious weed growth, and the second, that they cover up the land, which would otherwise be exposed to the direct rays of the sun. This is in many cases an advantage, as keeping the land perfectly clean all the time allows the sun to scorch the ground to a certain extent and to burn out any organic matter contained in it, as the land is exposed to the direct rays of the burning sun without any shelter whatever. In other words, the land is treated as a perpetual bare fallow, a condition which is not always advisable in this climate. The great disadvantage of growing subsidiary crops is, however, that during dry spells they take all the moisture

from the ground which is required for the proper development of the pines. Such crops tend, as already stated, to maintain the percentage of organic matter in the soil, and the cast leaves, stems, and roots of such crops, if returned to the soil, help to increase its organic contents. It will, therefore, be seen that the growing of such crops has several advantages as well as several disadvantages, and, provided that the land is kept well manured, it is questionable if the enhanced return from the land does not more than make good any possible loss from injury to the pines caused by the growing of such crops. There is one point to be taken into consideration in the growing of such crops, and that is, that the plant foods removed from the soil by such crops must be returned to the soil, and this often means manuring with special manures rich in the particular plant food that has been extracted from the soil by the particular crop. This is, however, a question which I will deal with in the next number, when I hope to go into the very important question of manuring.

FRUIT-GROWING ON OUR STATE FARMS.

By S. C. VOLLER.

Few people in this State will readily forget the big drought which has been with us so long, and which has told with such dire effect on our producing interests.

All classes on the land have suffered severely through the terrible check put on production. Fruit-growers have had their share of the trouble, as may be seen in half-dead orchards in many places, with nothing in the way of fruit to show as a reward for labour. Under these circumstances, it may be of interest to fruitgrowers who read the *Queensland Agricultural Journal* to know what measure of success attended our efforts at the State farms. We have had our difficulties. We have drawbacks to complain of and losses to deplore, but at the same time we have, in one or two directions, come out very fairly. Information as to how and where we have succeeded, and what varieties of fruit have yielded good marketable crops, should be of some value to those who are engaged in fruit-culture.

WESTBROOK.

At the time of last winter's pruning, judging by the arrangement of fruit spurs and buds on the trees, there was every prospect of a very fine crop, but the setting of the young fruit, after blossoming, was in nearly all varieties sadly interfered with. In fact, some sorts only made a half-hearted attempt at blossoming.

The continued absence of moisture, resulting in a deficient flow of sap, made growth of any kind almost impossible. The nature of the country where this orchard is planted added somewhat to the trouble, as, while the soil is undoubtedly good, it will not stand too long a period of drought. It was a most serious test for the trees to come out of a dry winter and face the spring and summer under a continuance of this bad state of things; and yet we have a number of trees that stood the test, and came out smiling with a good crop. It must be understood that towards the end of the year we got an odd thunder-shower or two that afforded a little relief, and in January we had a very useful fall, which put a new face on things; but the critical time had, in a sense, passed then, and the trees that carried a crop had fought their battle, and practically proved victorious. They really proved their value in carrying their crop through till the break, such as it was, occurred.

Apricots, although they tried to put on a crop, did not come up at all well, and may be put down as a failure, or nearly so.

Peaches bloomed well, and tried to put on a great crop, but only a very light setting carried on, excepting one or two varieties. The Robert Stewart was the most notable exception to the general shortage, and that put on a really good crop, which came nicely up to the mark in size.

Japanese plums proved themselves capable of doing good work under adverse conditions. The Burbanks, Wickson, Kelsey, Shipper, Juicy, and Chabot, all fruited well, the last-named bearing a crop that was well worth photographing. Among the Chickasaws, the Robinson came out with a marvellous crop—I do not know that I ever saw a tree of any kind with a finer show. The Golden Beauty also carried a good crop.

Very few of our European plums did anything at all, but the Early Orleans and Prince of Wales may be mentioned as pleasing exceptions to the general failure.

In pears, the Bartletts came first, with a thoroughly successful crop, which was sold in first-rate condition for satisfactory prices.

Clapp's Favourite, which is one of the best pears we have, did remarkably well, and bore very fine fruit. The Howell also did well, coming out with a commercially valuable crop. Other varieties made a first attempt at fruiting, and matured more or less fruit in good order—such as Winter Nelis, Catillac, Huyshes, Prince of Wales, Marie Louise d'Uclè, Smith's Hybrid, and Idaho.

The following apples proved themselves worthy of attention by growers:—

Cleopatra, which did remarkably well, Bismarck, Cellini, Trivett's Seedling, Gladney's Red, and London Pippin.

HERMITAGE.

Owing to the different nature of the soil in this orchard, it being much deeper and more retentive of moisture below, results were better than at Westbrook under the drought conditions.

Apricots were all more or less smashed up by a severe hailstorm early in the season, and although the later sorts came up with a good effort to a very fair size, when rain fell just before Christmas they split rather badly, as the rain came too late, and caused too sudden a rush of sap. The result was not entirely satisfactory from a marketing point of view.

European plums were, on the whole, a failure, though the following varieties came out well:—Prince of Wales, Early Orleans, Giant Prune, and Diamond. The following Japs matured good crops of profitable quality:—Burbank, Blood, Chabot, Shipper, and Kelsey. Some of these trees were a surprise to all who saw them, and I much regret that I was quite unable to get photographs of them. I am sure that they deserve attention on the part of settlers who intend growing fruit either for home use or for sale.

Peaches did wonders at this place, considering the season. We have a full row containing twenty-eight trees each of Foster, Globe, Lady Palmerston, and Muir, and all four held a really decent crop, and matured them up to a very fair standard of size and quality. The Fosters and Lady Palmerstons had the greatest proportion of small fruit, but they had also much that was really fine; while the Globes and Muirs came up in a way that we had not expected.

The Robert Stewart excelled itself this season, and did not seem to suffer in the least from the drought. This fruit was a picture, and the crop heavy. This peach will certainly pay, and I think has amply justified its right to a place in our orchards.

The Shanghai and Mountain Rose, Royal George, and Thurber, also matured paying crops.

The fruit from the whole of these peaches sold well at good figures, and appeared to be much appreciated by the purchasers.

Amongst the pears we had some very pleasing results, and the sight of many of the trees before the crop was gathered was a source of much astonishment to visitors.

The young Bartletts, which are just coming into bearing, gave us a good profitable crop of very nice quality. These sold remarkably well. The Howell,

Clapp's Favourite, Marie Louise d'Ucle, Flemish Beauty, Dearborne's Seedling, Mousullard, Jargonelle, and Black Achan, all came out well with good fruit, the first three being especially good.

In apples, our success lay with Cleopatra, which I consider was the best cropped apple we had, being heavy and of fine size. Early Richmond, Adams's Pearmain, Bismarck, Reunette du Canada, Cellini, Hockings's Greening, Trivett's Seedling, Gladney's Red, Jonathan, Kentucky Red Streak, Lady Carrington, and Rome Beauty. Several other varieties fruited moderately well.

A very fair crop of figs finishes the list, the best croppers being the Brunswick, Black Ischia and White Ischia, and White Genoa.

Now, if readers who are either growing fruit for profit or who intend to do so, will pay a little careful attention to the above, they may learn something to their advantage.

There can be no doubt in any mind as to the severity of the test put on our orchards during the past year or more, and I take it as being of the very highest value to be able to point to a goodly number of varieties which will stand such a test.

To growers we can say much more now than before on what to plant and what to avoid, and I am particularly pleased about one thing—namely, that not a few of the kinds that have come out best are the finest marketing fruits we have.

One matter deserves mention as being a big factor in our success, such as it has been. I refer to the thorough system of cultivation which we have always followed up in our orchards.

The thorough breaking-up and subsoiling which was done at planting, and the good work kept up since, has had a great deal to do with the results attained in growth and fruiting. Orchards planted on badly prepared land, and poorly cultivated afterwards, are bound to fail when a trial like this drought comes on them. It will pay all intending growers to make a careful note of this.

FRUIT SEEDS AND APPENDICITIS.

That doctors differ in their ideas of certain causes producing certain effects is here shown in connection with the trouble mentioned in our last number arising from fruit seeds.

The Dietetic and Hygienic Gazette says:—Many very intelligent people are deterred from swallowing the seeds of berries, grapes, and other fruits, lest the lodgment of these small bits of indigestibleness may induce that dreaded accident, appendicitis. This fear is utterly baseless, since the healthy appendix is protected by a valvular arrangement which prevents even the smallest seeds from entering it. It is only after inflammation has already destroyed its normal protection that any foreign substance can gain access to it. To feel compelled to eschew all seedy berries and fruits is to seriously curtail one's dietary, and it is entirely unnecessary. In fact, the free and constant use of ripe berries and fruits of all kinds is one of the best preventives of this dangerous disease. Fruit-eating prevents or helps to overcome constipation, and constipation is the most prolific cause of appendicitis. The physician should thoroughly disabuse his patients of this mistaken notion. All the smooth seeds are harmless.

Horticulture.

RE-PLANTING BOTTLE TREES.

Mr. P. R. Gordon, Chief Inspector of Stock, has drawn attention to the destruction of bottle trees, which took place during the late drought, for the purpose of providing food for starving stock, and says that he has frequently been asked to suggest some means of replacing this ornamental, and at times, useful tree. The matter was referred to Mr. F. M. Bailey, Government Botanist, and that gentleman states that although the plants may be propagated by other modes, the usual and best is by seed, which should be sown in a bed composed of three parts sandy loam and one part of leaf-mould, or in boxes filled with the same compost, giving plenty of room for drainage. Sow the seed $\frac{1}{4}$ -inch deep, 4 or 5 inches apart, in rows 18 inches apart. As the seeds retain their germinating power for only a short time, they should be sown as soon as possible after ripening. Plant out during showery weather, when the seedlings have attained a height of about 8 or more inches. Sow much closer than the above if in boxes.

In the localities where these trees are met with, a number of young plants will probably spring up, especially where the trees have been cut down. Some of these seedlings, if afforded protection, might be left to replace those destroyed, whilst others might be transplanted to other spots for purposes of ornamentation. The plants have deep, fleshy tap roots, and if these roots are not badly injured, bear removing very well.

SPRAY FOR VEGETABLES.

The following is, we are assured by Mr. S. C. Voller, Assistant Instructor in Fruit Culture of the Department of Agriculture, an infallible wash for destroying aphids and other insect life on vegetables. The trouble with Paris green is, that it will not stick to the glossy leaves of cabbages and cauliflowers, but collects at the base of the stalk and at the junction of the stalk and leaves. Sprays are open to the same objection. The following wash, however, will stick like varnish, and in an instant destroy all animal life on the plants.

Take 20 lb. of resin, 4 lb. caustic soda (98 per cent.) or 6 lb. (70 per cent.), 3 pints of fish oil or $2\frac{1}{2}$ lb. whale oil soap, and 140 to 150 gallons of water; place all the above ingredients in a boiler with 20 gallons of water, and let the whole simmer for 3 hours. Then add *hot* water slowly, and stir well till there are at least 40 gallons of solution; then add *cold* water to make up to 140 gallons. Never add *cold* water when cooking.

This wash, using only 80 gallons of water, will destroy the Mussel, Glover, and White Scales on citrus trees and the Mussel Scale of the apple.

Tropical Industries.

QUEENSLAND DATES.

When we published our notes on the Central Districts, we drew attention to the facilities for date growing. Since that time we have received several letters from date growers in the South and in the Western Districts. We now have a very good cluster of dates, grown by Mr. Gray, of George street, at Sandgate, within 50 yards of the sea. The tree, which, for the first time, has borne several clusters this year, is 12 years old, and was grown from a seed. Numerous suckers were cut off and destroyed. This is to be regretted, as the suckers from trees will bear in 5 or 6 years, whereas those grown from seed take from 10 to 12 years to bear, and then may turn out to be all male trees. Dates should be grown all over the State, as they flourish everywhere, from north to south, and from east to west. Had the early settlers here, 40 years ago, taken to heart the advice of Mr. L. A. Bernays, always an enthusiast on tropical fruit culture, Queensland would to-day have been a large exporter of dates. This may still be brought about. The trees, as stated, will bear in 5 years. Each tree will produce at its best 300 lb. of dates. They require no care, no water, except what they find at foot. They thrive on any soil. The fruit requires no preparation beyond packing in boxes or mats for export. Fowls must be kept from them, as these birds are exceedingly fond of dates, and will even eat the pith of the suckers.

THE GINSENG BUSINESS FAIRLY STATED.

There is no doubt in the minds of many who have taken the time or had opportunity to investigate the ginseng business, that there is a lot of humbug in the air. There are a lot of boomers in the business of getting people to buy a little stock of roots or seeds, or both. They tell, in their circulars and advertisements, of the marvellous prices the dried fruits bring in China, which may be true in most cases, but they are small beside the prices they ask and get for what they sell. Last fall I visited several of the ginseng gardens in the best section of New York for the growth of this plant, on purpose to see for myself the true state of the business, if that was possible. I was treated with the utmost courtesy by all the growers on whom I called, and was shown the inside of the matter, in all its departments. Some were among the largest growers and others had only very small fields. After looking over these gardens, and the business in general, it is my conviction that the business is not a humbug, but that there are humbugs in the business. By that I do not mean that those visited by me are humbugs, but that those who advise the general public to go into the growing of ginseng are perpetrating a fraud for their own immediate profit. The officials of the United States Department of Agriculture, here at Washington, tell me that one person is kept almost constantly busy answering letters of inquiry as to the culture of ginseng. They say, too, that most of the inquirers are persons of small means, and many of them widows who are expecting to find something that will bring big profits for little outlay or work. They seem willing to put their little savings into the business. The boomers keep the people stirred up by their artful schemes, while they are reaping the harvest. There are a very few so-called companies that are trying to buy up the little growers and corner the stock, so they can still further raise the price and reap all the profits. My advice is to beware of these boomers and their alluring offers. They hope and expect to make so much out of the sale of little plants and seed that they will not care what becomes of the business after

awhile. They are not selling the dried roots to be taken to China, which is the only market for it, except a very little that they may find unprofitable for seed production. There is no doubt a good market for the dried roots, but how long it will hold at the present high standard, or how soon and how low it will fall is unknown. That there will be profit in the growing of ginseng for market, under proper conditions, for some years to come I believe, but that the average grower will make it pay I do not believe. While the reader may think he is to be one of the successful ones, it is wiser to believe the reverse.

Ginseng plants are most exacting in their requirements. They must have just the right climate, the right soil—and that is very hard to find or make—and they must have the very shadiest of shady locations. A cool, even temperature, and deep loose wood soil are essential. It is little evidence of future success to know that ginseng grows in the woods near where it is proposed to plant a garden. Common garden conditions will not do at all. Nor will a shady place in the woods do very well. Growing under sheds is the best way. The roots are almost sure to be stolen, unless very closely watched. Insecurity is one of the main obstacles to final success. My advice is that nearly everyone let the ginseng business alone, and only plant after the closest study of the subject.—H. E. VAN DEMAN, in *Rural New-Yorker*.

COUNTERVAILING DUTIES ON BOUNTY-FED SUGAR.

RUSSIA AND THE MOST-FAVoured-NATION CLAUSE.

In February, 1903, the correspondence with the Russian Government respecting the interpretation of the most-favoured-nation clause in connection with countervailing duties on bounty-fed sugar was, by command of His Majesty, presented to both Houses of Parliament. Seven communications passed between the Governments of Great Britain and Russia. Summarised, the arguments are as follows:—The Russian Government protests against the "Indian Tariff Act (1894) Amendment, imposing countervailing duties on Russian sugar as a breach of the most-favoured-nation clause in the Treaty of Commerce of 1859. Her Majesty's Government considered that bounties override the clear intention of the most-favoured-nation clause. If the Russian Government could not adopt this view, Her Majesty's Government offered to denounce the Treaty of Commerce, a step which, however, they would be very reluctant to take in view of the friendly relations then existing.

A memorandum was then prepared by the Russian Ministry of Finance in consequence of the decisions of the Brussels Sugar Conference to the effect, *inter alia*, that to put into force the measures adopted by the Brussels Conference against Russia would be a violation of the Treaties, even if the Treaties contained a clause dealing with the establishment of bounties on exportation, for the Russian Government not only does not grant bounties of this kind, but has, on the contrary, suppressed a private syndicate which was forcing sugar producers to export their sugar abroad, and replaced the syndicate by a system of internal domestic control. The measures employed by the Russian Government to regulate the sugar industry, not only do not tend to encourage the exportation of sugar abroad by either direct or disguised bounties, but, on the contrary, have brought about, among other results, the abolition of the encouragement to exportation which existed before the law of the 20th November, 1895.

In reply to M. de Stael, His Majesty's Government still hoped that Russia would become a party to the convention. In the contrary case, should the necessity arise, they must apply the convention. They decline any proposal for inquiry on the general effect of bounties.

Against this, the Russian Government maintained their point of view, that countervailing duties are an infringement of the Treaty of Commerce. They proposed arbitration, or an appeal to the Hague Tribunal.

His Majesty's Government could not accept this Russian view of the situation, nor would they agree to arbitration. They held themselves released from the obligation to engage in further controversy by their offer to denounce the Treaty of 1859.

The wide divergence of views which is revealed by the correspondence hitherto exchanged by the two Governments precludes, it would seem, any chance of a compromise—all the more so as the British Government has declined the offer made by the Imperial (Russian) Government to submit the matter to arbitration.

Finally, the British Government has declared that the penal clause will only be applied to Russian sugar "in the case of the International Commission finding that bounties did result from the Russian system." The question therefore must still be considered an open one for the moment, and any further exchange of views should be suspended until the decision of the abovementioned Commission.

PLANTAIN FIBRE.

Although the best fibre, known as "Manila hemp," is obtained from a species of plantain—the *Musa textilis*—other varieties of plantains and bananas contain a good fibre, having a certain market value. In Malabar the manufacture of plantain fibre is being boomed, and a correspondent of the *Kerala Sanchari*, the leading vernacular paper in Calicut, writes to say that a friend of his recently extracted a quantity of plantain fibre and forwarded it to Messrs. Eddie and Christy, of London, who valued it at £15 per ton, and also wrote to say that they would give £25 for superior quality of fibre, and were prepared to receive supplies to any extent. Now that a fair start has been made, the opportunity ought to be seized by wealthy Malayalis—and there are several whose ancestral wealth is rusting in disuse—to launch what promises to be a remunerative industry. The plantain tree is about the most familiar feature in the sub-arborescent vegetation of the Malabar coast, and the raw material for the fibre is to be had in abundance.

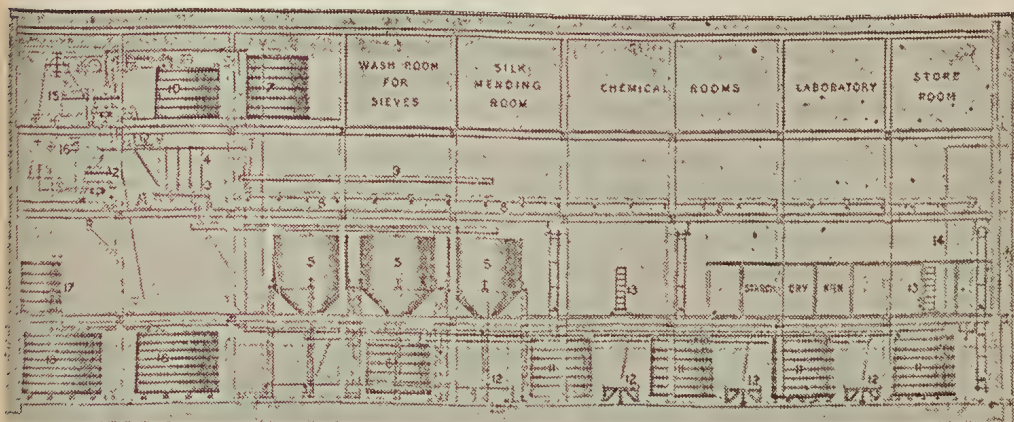
The fibre obtained from other varieties of the plantain is worth a little more than half the price of Manila hemp. There is any amount of the raw material in Queensland, tens of thousands of stems being cut down after bearing and allowed to rot on the ground. Although the fibre which these stems would yield cannot compete with that made from *Musa textilis*, yet, when such prices as are above quoted can be got for it, it seems a wilful waste of a valuable material not to utilise it. There are some very simple and cheap machines made for the purpose of cleaning banana stems. In a Madras official bulletin there is a description of machinery of this kind invented by Mr. Underwood, and also by Major Maitland, both of which have, on trial, proved efficient. The fibre may be extracted by scraping the plantain strips with a bamboo scraper on a hard, smooth board 5 feet by 6 feet by 2 inches, but this of course is a slow process. We draw attention to this matter in the hope that interest may be aroused in a possibly paying industry, and thus a new source of revenue be added to the banana trade.

CASSAVA AS A COMPETITOR OF MAIZE IN THE PRODUCTION OF STARCH AND ALLIED PRODUCTS.

At a meeting at the Toronto (Canada) University, Professor Geo. Archbold, Ph. D., read a paper on the above subject. He said that at the present time the demand for maize and other cereals is advancing their value, so that, in the near future, they will not be available for the manufacture of starch. Maize

starch has its own characteristics, which distinguish it from other starches. If a cheaper raw material be suggested for the production of starch and allied products, it must yield them of the same quality. In the plant cassava we have a raw material which yields a starch of the highest purity, possessing all the characteristics of the maize product, the cost of production being one-fifth that of the maize. Both the sweet (*Manihot aipi*) and the bitter varieties (*Manihot utilissima*) are equally important sources of starch for edible and manufacturing purposes. Experiments made in Florida with fresh roots, the average percentage of starch was found to be 24.75, and with Jamaica roots 26.23; the product obtained from several pounds of the root had all the characteristics of the best maize starch, and 4 per cent. of cane sugar was recovered from the liquor. Compared with maize and potatoes, upon which practically the whole world depends for its supply of starch, the average yield of starch is as follows:—Maize, 53; potatoes, 18; cassava, 25 per cent. An acre of ground yields 40 bushels of maize, which in turn yield 1,200 lb. of starch, whilst the same ground will yield 10 tons of cassava, yielding 6,720 lb. of glucose, and 5,000 lb. of starch, and it is possible to reach a much greater amount. In Jamaica, 20 tons per acre could be grown with ease.

With maize at 45 cents (1s. 10½d.) per bushel, the crude starch from that source is 1½ cents (¾d.) per lb. With potatoes at 50 cents (2s. 1d.) per bushel, the unmanufactured starch is 5 cents (2½d.) per lb., while cassava, grown on a basis of 8 or 10 tons per acre (as at Lake Mary, Florida, where the only complete cassava starch factory in the world is situated), costs half-a-cent (¼d.) per lb in the unmanufactured state. It is thus quite evident that cassava is the cheapest known source of starch, costing one-fourth as much as maize starch. A plant has been devised by Professor Archbold, by means of which the whole 25 per cent. of dry starch can be obtained, and this plant can be worked 25 per cent. cheaper than the potato starch plant, the process being perfectly automatic and continuous. The problem, then, of the cassava starch manufacture on a commercial basis may be considered solved. The plant will work up 100 tons of roots per day of 10 hours. The entire process only occupies 3 days, when the starch is ready for market, while maize, under the most favourable conditions, requires from 12 to 14 days.



LONGITUDINAL SECTIONAL ELEVATION OF STARCH PLANT.

EXPLANATORY KEY.

- | | | |
|----------------------------|---|---|
| 1. Degerminator | 8. Starch Tables | 14. Pumps, &c., to convey Starch to Glucose House |
| 2. First Grinder | 9. Starch Conveyers | 15. Corn Screen |
| 3. Shakers | 10. Break Tanks | 16. Magnetic Separator |
| 4. Sprinklers over Shakers | 11. Washing Tanks | 17. Hot Water Tank, to supply Steep Tanks |
| 5. Cones | 12. Boxing Tables | 18. Steep Tanks. |
| 6. Well, after Cones | 13. Cars for the Drying Kilns and Packing Rooms | |
| 7. Regulator Tanks to S | | |

HOW THE STARCH IS MADE.

The first stage of the process is to wash the roots. This is effected by an Archimedean screw working in a trough. The roots are fed at the lower end, and are carried by the screw upwards against a descending stream of water to the highest end, escaping perfectly clean. They are thence conveyed by an indiarubber belt to the rasper, something like that used in a sugar-beet factory. It consists of an upright revolving cylinder with three compartments, armed with saw-like teeth inside. The roots are fed into the upper end, and the pulp falls through the lower end to the mill. This mill distintegrates the cellular structure, so rupturing it that the starch may be washed out with a small amount of adhering tissue. In this condition it falls to the separator, which is a conical iron vessel, in principal similar to "Lockhardt's separator," used for the preparation and dressing of ores. The soft pulpy magma, as it falls down a tube in the centre of this conical vessel, is met by an upward current of water, which carries the starch particles upward through a wire gauze diaphragm in the upper portion of the cone, a few inches below the outlet. When the pulp is exhausted, it is discharged by an automatic arrangement at the bottom of the cone to the pressroom to be freed of water, by dropping on to a wire belt and passing between rubber rollers. The impure starch milk flows, at 3 degrees Beaumé, to the settling cones. These vessels consist of two iron cylinders, 9 feet by 12 feet in diameter, the bottom terminating as a cone of 50 degrees angle, 7 feet slant, with a 2-inch gate-valve at the bottom as outlet. In the centre of the cone is a cylinder of 20-oz. copper, 10 inches in diameter, brought within 18 inches of the bottom. The impure starch liquid is allowed to flow down the tube to the bottom of the cone. In then ascends in the increasing sectional area of the cone, in which it suffers reduction of velocity. The downward motion of the starch particles, caused by gravity, overcomes the motion of the fluid, which continually flows away as dirty water through the pipe in the upper portion of the vessel, whilst the starch, in a highly concentrated state (generally 8 degrees Beaumé), is continually drawn off from the valve in the bottom of the cone to the mixing vats below, to be treated with alkali or other chemical means, and pumped up to the "regulators" on the upper floor, and thence to the floor by gravity, through the shakers on the floor below, and run to the last purifying cones. The starch milk is freed from all adhering fibre before passing to the purifying cones. These vessels are of the same size and form as the former, so arranged, however, that the starch can be completely purified and all objectionable matters removed. In the centre is suspended a conical pipe within a larger conical pipe, at the bottom of the cone is a conical deflector, and an acute conical addition to the main cone, containing the necessary agitating apparatus to prevent the starch setting hard. The starch milk, as it passes through the shaker, flows down a pipe of increasing section, and afterwards is deflected radially by means of the conical arrangement; the liquid then ascends in the increasing sectional area of the cone, in which it suffers such reduction in velocity that the downward motion of the pure starch particles, caused by gravity, overcomes the motion of the fluid, which continually flows away through the pipe in the upper portion of the vessel.

The starch milk, now pure, and at any desired gravity, is drawn off from the lower part of the cone, and is pumped up to the boring tanks on an upper floor. These tanks are vats made of cypress wood 10 feet square, with the necessary gearing and agitators, which hold the concentrated and purified starch milk in readiness for the boxes, which are 7 inches by 7 inches by 5 feet $7\frac{1}{2}$ inches long, inside measurement, with perforated bottom, and lined with muslin. These boxes are placed side by side on a table provided with a vacuum chamber, and the starch milk from the vats flows into them, the water being extracted by the vacuum pump. Here, the starch is deprived of 75 per cent. of its water, and becomes a long block of solid starch, which is cut up into 7-inch cubes, wrapped in paper, and placed in the kiln to dry ready for market.

The atmosphere of a starch factory contains from 200 to 50,000 living germs or ferments per cubic centimetre (1 centimetre super = .393 inches). It is not then to be wondered at that the starch, exposed to such an atmosphere, becomes invaded by millions of these organisms, and becomes sour. Hence so much alkali treatment. The product is equal to the best Bermuda arrowroot, and at the same time has all the characteristics of pure corn starch in its various commercial forms.

By-products.—The fibrous and glutinous matter left in the filter presses is mixed with the exhausted and pressed magma from the starch separator, and dried and sold as cattle food. Glucose is also made from Cassava pulp. Cassava, it will be seen, is a formidable competitor of maize, owing to its higher yield of starch and glucose per acre. The starch in the boxes is made into Tapioca.

Professor Archbold accompanied a paper he read before the University College, on the manufacture of maize starch, with a diagram and description of the necessary machinery. The diagram, which, as well as this digest of the paper on Cassava starch, we take from the *Journal of the Society of Chemical Industry*, is here reproduced. The machinery is very simple, and not at all costly. There should be a good opening for the Cassava starch-making industry in Queensland, where Cassava grows to perfection on the whole length of the coast-line, and also inland.

TOBACCO NOTES.

By R. S. NEVILL.

The State of Wisconsin has appropriated 10,000 dollars to the improvement of its tobacco crop. One-half of this is for securing improved varieties of seed and distributing free among the growers, and the other half for experiments in growing and curing.

This, supplemented as it probably will be by appropriations from the United States Department of Agriculture, and assisted by their specialists, should enable them to do valuable work.

The total crop of cigar tobacco of Sumatra for 1901 was something near 35,000,000 lb., and sold for an average price of 3s. 9d. per lb.

EDWARDS, GOODWIN, AND Co.'s REPORT.

Liverpool, 28th February, 1903.

Stock.

28th February, 1903 ... Hhds. 19,193 47,236 3,831 51,647 148 = 122,055
 Strips: Western—Fillers, 5d. ; rather short, 5½d. to 5¾d. ; very middling to middling, 6d. to 6¾d. ; good to fine, 7d. to 8d. Burley, 5¾d. to 8d. Virginia Dark—Fillers, 5d. to 5½d. ; rather short 6d. ; very middling to middling, 6½d. to 7½d. ; good to fine, 8d. to 10d. Virginia and Carolina Bright—Semi-dark, 7d. ; semi-bright, 7½d. to 9d. ; medium or mixed, 9½d. to 10½d. ; good to fine, 11d. to 12d. to 14d. Leaf: Western—African export, 5d. to 6½d. ; short trade, 4d. ; medium to good trade, 4½d. to 6d. Burley—6d. to 7d. to 8d. Virginia Dark—medium trade, 4d. to 5d. ; good to fine trade, 5½d. Virginia and Carolina Bright—common or semi-bright, 7½d. ; medium or mixed, 8d. to 10d. ; good to fine, 10½d. to 11½d. to 15d.

There has been a fair general inquiry in the market during February, especially towards the close of the month for Western Strips. The statistical position of this sort of tobacco is a steadily improving one, as since 31st October, when the visible stock was at its highest, deliveries from this port have been very good, amounting to 6,479 hogsheads, against imports for the same period of only 849 casks, so that supplies have been reduced by 5,630 hogsheads. Buyers appear to be thinking that, with prices at a moderate level for strips of an exceptionally useful character (as those of the last import

undoubtedly are), and with a small import of inferior class to look forward to next fall, they cannot very well make a mistake in stocking up with present offerings.

The later samplings of Virginia and Carolina Brights and Semi-brights show desirable character, and the prices now quoted for this growth are more moderate than for a long time back.

Forestry.

HEDGES IN CUBA.

When Robinson Crusoe built a stockade on his island, he drove in green stakes. These soon took root, threw out branches, and thus an impenetrable barrier was raised between him and his friends the cannibals. Mr. F. de S. Buchanan, of Boiawai, New Guinea, informs us that the same thing is done in Cuba. When a Cuban farmer wants to fence in his land, he does not build a fence, he plants it, and it grows into a solid fence. First, he cuts a great bundle of "Pinon" twigs. Then he scratches a little trench along the line of fence and sticks in the cuttings a few inches apart. The soil of Cuba is so rich, and the climate so moist and warm, that directly the cuttings take root, they throw out branches and leaves, and presently there is a dense hedge of "pinon" trees enclosing the field. There are no nails to drop out, or palings or rails to fall down and let the cattle in on the crops. This fence is good for 100 years. Our correspondent does not tell us what the "pinon" tree is. The Spanish "pino" means a pine tree, but "piñon" means "pine-apple seed" and "a bird's wing." Can any of our readers enlighten us as to the English name of the tree or shrub? In Mauritius, hedges are made of a shrub called the "pignon d' Inde."

PIGNON D' INDE (PHYSIC NUT).

When we received the above communication concerning the "Piñon" in Cuba, we were unable to ascertain what the plant really is. Since then, Mr. L. Ehrmann, of the Queensland Meat Export Co., paid a visit to the Technological Museum, at the Department of Agriculture, and there found in the specimen cases a nut, which he says is the fruit of the tree in question. The Government Botanist at once recognised it as the Physic Nut (*Jatropha curcas*), which he described and illustrated in this *Journal* (Vol. VI., p. 382). It is a poisonous shrub or tree, a native of South America, and the nuts are very dangerous, especially to young children who have eaten them in ignorance of their deadly properties. The French name is Pignon d' Inde, the South American and Cuban equivalent is "piñon." The seed gives a good oil for machinery.

Mr. Ehrmann also appends to his note on the Physic Nut, the names of a few trees now grown in Mauritius, which would be useful if grown largely in Queensland.

Albizzia Lebbeck (Bois noir, or Black wood). Habitat: From Western India to Arabia. The timber (heart-wood) is durable and hard, in great repute for making naves of wheels and gun stocks.

Mr. F. M. Bailey, Government Botanist, in his work, "Queensland Woods," describes several species of *Albizzia* indigenous to Queensland. The *A. procera* would seem to be nearest allied to *A. Lebbeck*. Mr. Ehrmann mentions *Casuarina Equisetifolia*. This also is a native of this State, and has been described by Mr. Bailey, and illustrated in this *Journal*.

This *Casuarina*, called by the aboriginal natives "Wunna-wunnarunpa," and also the Camphor Laurel, Mr. Ehrmann recommends should be more extensively planted, especially in Northern Queensland.

Science.

COMPOSITION OF SUGAR-CANE.

(Examined for Feedstuff Purposes.)

The examination of the sugar-cane as a feedstuff was undertaken on account of the great draft made upon it last year to keep dying stock alive.

ROSE BAMBOO.

(Standover cane, H. Epps, Childers, Isis.)

Substances.	Cane Tops (Fresh).	Tops of Cane Stalk (Fresh).	Cane Stalks (Fresh).
	Per cent.	Per cent.	Per cent.
Water	71.20	77.20	71.42
Nitrogen	0.43	0.28	0.23
Proteids	2.59	1.68	1.35
Starch	3.36	...	...
Soluble Sugars	1.24	3.64	12.43
Crude Fat	0.75	...	...
Mineral Matter	1.89	1.22	0.86
Poisonous Bodies .. ...	...	...	...

MALABAR.

Water	71.96	77.70	71.15
Nitrogen	0.45	0.28	0.24
Proteids	2.72	1.68	1.46
Starch	3.51	...	...
Soluble Sugars	1.39	3.17	10.0
Crude Fat	0.69	...	...
Mineral Matter	1.74	1.44	0.97
Poisonous Bodies .. ...	...	...	...

For purpose of comparison, and to show the very dissimilar composition of the sugar-cane, as a feedstuff, at different stages of growth, and particularly where the growth has been retarded and rendered more or less abnormal by excessive drought, the analyses are added of samples of Rose Bamboo cane, grown at the Mackay Experiment Station last year. These samples were of cane only one-half grown, and are divided into only two parts—the "cane tops" and the cane—the latter being young, and of a similar composition throughout, the composition differing from that of any single part of the mature cane:—

	Cane Tops.	Cane.
	Per cent.	Per cent.
Moisture	66.80	71.40
Nitrogen	0.33	0.45
Proteids	2.06	2.81
Starch	1.13	1.80
Sugars	4.20	9.13
Crude Fat	1.05	0.34
Mineral Matter	2.49	0.82

These samples were much dried out by the excessive drought, and this drying out had altered very notably the normal composition of the cane leaves and the cane. When the leaves wilt and parch, one of the first effects is a loss of nitrogen. Then the insoluble starch, and such bodies, go over into more

soluble sugars, which finally disappear by fermentation. All feedstuffs can vary very much in their composition, and this variation is governed first by the state of development in normal conditions of growth, and secondly by climatic conditions, which can totally upset the normal state of plants and crops.

Section of Feedstuffs, Department of Agriculture.

J. C. BRUNNICH, Chemist.

W. MAXWELL, Director.

COMPOSITION OF GREEN FEEDSTUFFS.

PANICUM MAXIMUM, PANICUM MUTICUM, AND PASPALUM DILATATUM.

(Grown by T. H. Wells, Childers, Isis.)

These grasses were grown upon the red volcanic soils of the Isis. The growth of all was very fine, being the flush result of good rains and high temperature. The grasses were just reaching the seeding stage when cut, and are representative of the varieties at their very best. For comparison, the analysis of a drought-damaged sample of *Paspalum dilatatum* is added in the outer column:—

Substances.	<i>Panicum Maximum.</i> (Fresh.)	<i>Panicum Muticum.</i> (Fresh.)	<i>Paspalum Dilatatum.</i> (Fresh.)	<i>Paspalum Dilatatum.</i> (Drought dried.)
	Per cent.	Per cent.	Per cent.	Per cent.
Water ...	73.95	76.40	70.60	40.40
Nitrogen ...	0.69	0.53	0.61	0.82
Proteids ...	4.12	3.17	3.69	5.12
Starch ...	1.38	2.57	2.45	6.07
Sugars ...	1.35	0.82	1.62	8.38
Fats ...	0.53	0.49	0.70	0.28
Mineral Matter ..	3.64	2.89	3.79	4.54
Prussic Acid ...	0.0031	0.0045	...	...

The example of *Paspalum* given in the fourth column was grown at Mackay. It was a poorly grown sample, and had suffered severely from the drought, which is shown by the low content of water at cutting. Not less than 25 per cent. of the nitrogen, and 75 per cent. of the fats, had been destroyed by the action of the drought. A somewhat similar effect had happened to samples of sugar-cane that had suffered under the same drought conditions. These facts made it clear that the value, as a feedstuff, of crop produce depends upon the state of growth of normal crops when they are cut and used. There is a stage after which natural grown crops begin to dry up and lose value, which means that the nitrogen begins to disappear, and also to go over into less soluble and digestible forms, and the fats decompose. These matters will be more fully dealt with on a later occasion. The prussic acid in *Panicum muticum* is close to the danger point. It must be fed with care.

Section of Feedstuffs, Department of Agriculture.

J. C. BRÜNNICH, Chemist.

W. MAXWELL, Director.

Statistics.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE TOTAL RAINFALL FOR EACH MONTH OF THE YEAR IN THE AGRICULTURAL DISTRICTS OF QUEENSLAND.

STATIONS.	1902.											1903.		
	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.		Jan.	Feb.	Mar.
<i>North.</i>														
Bowen ...	2.01	0.68	Nil.	0.44	0.11	0.02	Nil.	0.06	0.06	3.16		1.66	7.65	16.44
Cairns ...	11.43	3.48	2.34	4.97	3.87	0.95	Nil.	0.16	1.38	5.15		21.32	10.28	32.51
Geraldton ...	7.55	12.83	5.39	8.10	7.32	1.77	Nil.	0.29	0.44	5.53		38.94	17.24	45.00
Herberton ...	3.66	1.54	1.07	1.58	2.05	0.08	Nil.	0.93	1.13	7.02		6.88	3.69	20.80
Hughenden ...	0.53	*	Nil.	Nil.	Nil.	Nil.	Nil.	0.05	0.22	2.77		1.52	0.99	0.95
Kamerunga ...	14.24	3.40	2.63	5.12	4.00	0.81	Nil.	0.29	1.57	3.79		20.36	10.82	37.45
Longreach ...	0.18	0.03	0.03	Nil.	Nil.	0.05	Nil.	Nil.	1.27	1.56		1.81	0.09	3.48
Lucinda ...	2.67	1.78	*	0.63	0.21	0.45	Nil.	0.22	0.10	2.47		17.43	11.66	44.24
Mackay ...	4.41	6.73	1.26	2.33	0.59	0.80	Nil.	0.17	0.35	7.71		10.45	6.47	13.51
Rockhampton ...	1.68	0.21	Nil.	Nil.	Nil.	0.09	1.41	0.05	0.51	5.60		0.92	1.68	3.73
Townsville ...	1.61	0.35	0.04	0.10	Nil.	0.10	Nil.	0.29	0.08	6.50		4.66	8.11	19.80
<i>South.</i>														
Barcaldine ...	0.37	0.02	Nil.	Nil.	Nil.	0.08	0.02	0.21	0.95	6.41		3.73	0.40	0.94
Beenleigh ...	0.68	0.42	Nil.	0.11	0.62	0.49	0.28	2.92	3.36	1.83		1.88	4.77	6.49
Biggenden ...	1.80	0.65	Nil.	0.04	0.08	0.04	1.58	2.34	0.25	8.98		2.25	3.15	3.95
Blackall ...	0.34	0.05	Nil.	0.01	0.01	0.21	0.27	0.12	1.05	4.61		3.04	1.50	3.87
Brisbane ...	0.76	0.17	0.47	0.06	0.55	0.98	1.30	3.42	2.59	1.82		1.31	5.35	4.79
Bundaberg ...	1.99	0.43	0.02	Nil.	0.07	0.13	0.31	1.24	0.65	1.38		0.97	2.60	6.05
Caboolture ...	1.29	1.99	Nil.	0.03	0.20	0.05	1.09	2.30	3.17	1.74		5.15	3.42	9.59
Charleville ...	0.42	0.23	Nil.	0.12	Nil.	1.04	0.30	1.05	2.14	4.79		1.70	0.43	2.94
Dalby ...	0.30	2.00	Nil.	0.15	Nil.	0.41	0.70	3.14	2.79	3.29		1.28	1.22	4.89
Emerald ...	0.97	0.30	Nil.	0.01	Nil.	Nil.	0.02	0.01	1.58	8.42		2.30	2.49	1.48
Esk ...	0.75	1.25	Nil.	0.04	0.25	0.15	0.64	0.93	4.00	7.67		1.32	3.51	4.46
Gatton College ...	0.26	*	0.04	0.03	0.04	0.64	0.73	2.41	3.72	5.14		3.68	3.81	2.60
Gayndah ...	0.99	0.81	0.29	Nil.	Nil.	0.05	0.64	2.10	2.08	3.37		0.77	2.08	2.30
Gindie ...	0.78	0.47	Nil.	Nil.	Nil.	Nil.	0.10	Nil.	1.65	7.14		1.43	3.15	0.49
Goondlwindi ...	1.20	0.06	0.02	0.41	Nil.	1.19	0.21	1.50	0.89	2.21		1.84	0.72	4.40
Gympie ...	2.33	1.09	0.23	Nil.	0.36	0.94	1.38	3.80	1.40	4.32		2.40	3.27	5.96
Ipswich ...	0.32	0.03	0.02	0.15	0.31	0.77	0.30	2.86	3.45	1.84		1.36	5.55	3.79
Laidley ...	0.39	0.10	0.20	0.06	Nil.	0.40	0.89	2.21	3.27	5.13		0.71	3.63	2.63
Maryborough ...	0.96	1.57	0.36	0.24	0.29	0.57	0.69	0.91	1.11	4.02		2.09	2.76	3.23
Nambour ...	1.61	†	0.28	0.04	*	0.70	0.35	1.26	1.66	2.64		2.53	5.03	5.18
Nerang ...	0.65	0.65	0.35	0.52	1.07	1.22	1.17	3.15	1.75	1.73		3.36	4.73	4.84
Roma ...	0.54	0.15	Nil.	0.20	Nil.	0.46	0.35	0.92	0.86	2.35		0.75	0.15	2.48
Stanthorpe ...	0.56	0.10	0.87	0.78	0.15	0.94	0.95	2.29	3.98	1.75		0.23	1.59	0.95
Tambo ...	0.68	0.04	Nil.	0.01	Nil.	0.28	0.06	0.41	1.34	4.14		2.43	0.15	4.73
Taroom ...	1.30	0.33	Nil.	Nil.	Nil.	0.17	0.45	0.63	1.40	2.88		4.32	1.53	1.29
Tewantin ...	3.44	2.84	0.80	0.91	0.91	0.85	0.87	1.94	1.96	1.35		1.90	5.30	11.52
Texas ...	0.42	Nil.	Nil.	0.88	Nil.	1.57	0.13	2.42	1.67	1.42		0.18	0.94	0.48
Toowoomba ...	Nil.	0.79	0.03	0.38	0.19	0.56	0.37	3.07	3.18	6.99		2.21	3.42	3.60
Warwick ...	0.55	Nil.	0.15	0.63	0.20	0.94	0.43	2.96	2.87	4.61		0.68	2.59	2.13
Westbrook ...	0.06	0.41	Nil.	0.28	0.06	0.29	0.38	3.20	3.34	3.37		4.21	2.70	1.52

CLEMENT L. WRAGGE,

Wragge's Weather Bureau.

PRICES IN BRITISH MARKETS OF ARTICLES WHICH CAN BE PRODUCED IN QUEENSLAND.

BUTTER.—New Zealand, choicest, 106s. to 108s., finest, 102s. to 104s.; Danish, choicest, 117s. to 118s., finest, 112s. to 114s.; Canadian, finest, 94s. to 96s.; Australian (Victorian), choicest, 102s. to 104s., finest, 98s. to 100s. per cwt.

CHEESE (duty free).—Canadian, 65s.; New Zealand, 64s.

CONDENSED MILK.—18s. 6d. to 20s. 6d. per case in 20-case lots.

SUGAR (duties, raw, 2s. to 3s. 10d. per cwt. ; refined, 4s. 2d. and $\frac{1}{4}$ per cent.).—Refined, £15 to £16 ; raw, £13 to £14 per ton ; German beet, 88 per cent., 8s. 4 $\frac{1}{2}$ d. per cwt.

MOLASSES (duty, 2s. per cwt. and $\frac{1}{4}$ per cent.).—6s. to 8s. per cwt.

RICE (duty 5d. per cwt.).—Rangoon, £9 to £15 ; Japan, £13 to £16 ; Java, £20 to £25 ; Patna, £18 to £22 per ton.

COFFEE (in bond, duty 1 $\frac{1}{2}$ d. per lb. and $\frac{1}{4}$ per cent.).—Ceylon plantation, 100s. to 120s. ; peaberry, 47s. to 106s. ; Santos, 26s. to 52s. ; Mocha, 50s. to 100s. ; Jamaica, 100s. to 130s. per cwt.

CHICORY ROOT, dried (duty paid).—£26 to £31 per ton ; manufactured (duty 2d. per lb.), £33 to £35 per cwt.

ARROWROOT (duty, 5d. per cwt.).—Bermuda, 1s. 3d. to 1s. 6d. ; St. Vincent, 1 $\frac{1}{2}$ d. to 4d. ; Natal, 6d. to 7d. per lb.

WHEAT.—Manitoba, 33s. to 33s. 6d. per 406 lb.

FLOUR.—21s. to 30s. 6d. per 280 lb.

MALTING BARLEY.—28s. to 29s. 6d. per 448 lb.

OATS.—New Zealand, 26s. to 28s. per 280 lb.

SPLIT PEAS.—45s. per 504 lb.

GINGER.—Japan, 28s. to 30s. ; Jamaica, 48s. to 52s. per cwt.

PEPPER.—Black, 5 $\frac{3}{4}$ d. to 8 $\frac{1}{4}$ d. ; white, 8 $\frac{3}{4}$ d. to 9 $\frac{1}{2}$ d. per lb. ; capsicums, 16s. to 80s. ; chillies, 30s. to 35s. per cwt.

WINES.—Australian Burgundy, red, 18s. per dozen ; quart flagons, 17s. to 23s. per dozen.

GREEN FRUIT.—Oranges, 7s. for common to 49s. for finest selected per case ; lemons, 16s. to 25s. per case ; bananas, 8s. to 12s. per bunch ; apples, Tasmanian, early shipment (London, April 2), 6s. to 13s. 6d. per case ; Australian, 8s. 6d. to 14s. 6d. ; Californian, 11s. to 13s. ; New Yorks, 16s. 6d. per case ; Victorian pears, 10s. to 12s. per case ; Winter Nells, 19s. per case ; grapes, 16s. to 31s. per barrel ; pineapples, 2s. to 5s. each.

DATES.—Tafilat, 60s. to 70s. per cwt. ; Persian, 10s. 6d. to 14s. 6d. per case ; Egyptian, 29s. to 35s. per case.

COTTON.—Uplands, 6d. ; Sea Island, 9d. to 1s. per lb.

COTTON SEED.—£4 10s. per ton.

COTTON-SEED OIL CAKE.—£6 17s. 6d.

COTTON-SEED OIL (CRUDE).—21s. to 21s. 3d. per cwt.

LINSEED.—42s. 6d. to 43s. per 416 lb.

LINSEED OIL CAKE.—£7 17s. 6d. to £8 per ton.

LINSEED OIL.—25s. to 25s. 3d. per cwt.

OLIVE OIL.—£55 per tun (252 gallons).

MANILA HEMP.—£34 to £36 per ton.

NEW ZEALAND HEMP.—£31 per ton.

SISAL HEMP.—£35 per ton.

FLAX.—£42 to £52 per ton.

FROZEN MEAT.—The following are the Frozen Meat Trade Association's Smithfield market quotations for the undermentioned classes of frozen meat, based on actual sales of not less than 100 carcasses of mutton or lamb, or 25

quarters of beef of fair average quality. These quotations are not for selected lines, but for parcels fairly representative of the bulk of the shipments now on the market:—

New Zealand Sheep.

(Crossbred Wethers and Maiden Ewes.)

	April 9.	April 18.
Canterbury, light (48 lb. to 56 lb.)	5d.	4 $\frac{3}{4}$ d.
Canterbury, medium (56 lb. to 64 lb.)	4 $\frac{7}{8}$ d.	4 $\frac{3}{4}$ d.
Canterbury, heavy (64 lb. to 72 lb.)	4 $\frac{3}{8}$ d.	4 $\frac{3}{8}$ d.
Dunedin and Southland (56 lb. to 64 lb.)	...	4 $\frac{1}{8}$ d.
North Island (55 lb. to 65 lb.)	3 $\frac{7}{8}$ d.	3 $\frac{7}{8}$ d.

Australian Sheep.

(Crossbred and Merino Wethers.)

Heavy (over 50 lb.)	...	3 $\frac{9}{16}$ d.	3 $\frac{9}{16}$ d.
Light (under 50 lb.)	...	3 $\frac{7}{16}$ d.	3 $\frac{7}{16}$ d.

River Plate Sheep.

(Crossbred and Merino Wethers.)

Heavy (over 50 lb.)	...	3 $\frac{11}{16}$ d.	3 $\frac{11}{16}$ d.
Light (under 50 lb.)	...	3 $\frac{11}{16}$ d.	3 $\frac{11}{16}$ d.

New Zealand Lambs.

Canterbury, light (28 lb. to 36 lb.)	5 $\frac{7}{8}$ d.	5 $\frac{1}{4}$ d.
Canterbury, heavy (36 lb. to 42 lb.)	5 $\frac{3}{8}$ d.	5 $\frac{1}{4}$ d.
Dunedin and Southland (28 lb. to 42 lb.)	...	5 $\frac{1}{4}$ d.
North Island (28 lb. to 42 lb.) new season's...	...	5d.

Australian Lambs.

30 lb. to 40 lb.	...	4 $\frac{7}{8}$ d.
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River Plate Lambs.

30 lb. to 40 lb.	...	4 $\frac{7}{8}$ d.
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New Zealand Frozen Beef.

Ox, fores (180 lb. to 220 lb.)	...	3 $\frac{3}{4}$ d.
Ox, hinds (180 lb. to 220 lb.)	...	4 $\frac{1}{4}$ d.

Australian Frozen Beef.

Ox, fores (160 lb. to 200 lb.)	...	None offering.
Ox, hinds (160 lb. to 200 lb.)	...	None offering.

River Plate Frozen Beef.

Ox, fores (160 lb. to 220 lb.)	...	3 $\frac{3}{4}$ d.
Ox, hinds (160 lb. to 220 lb.)	...	4 $\frac{1}{4}$ d.

(All quotations for beef are nominal.)

EGGS.—French, 11s. to 12s. 6d.; Danish, 8s. 6d. to 10s. 6d. per 120.

BACON.—Irish, 54s. to 58s.; American, 46s. to 52s.; Canadian, 52s. to 54s. per cwt.

HAMS.—Irish, 70s. to 102s.; American, 48s. to 55s. per cwt.

TALLOW.—Beef, fine, £35 5s.; medium, £31; mutton, fine, £34 10s.; medium, £31 10s. per ton.

COPRA (cocoanut kernel).—£15 15s. to £16 10s. per ton; £8 to £9 per ton at the South Sea Island trading stations. Corresponding value in Queensland, £10 to £12 per ton.

COCOANUT OIL.—£35 per ton.

MARUPIAL SKINS.—Prices at last sales are given in the April issue of the *Journal*.

Agricultural Patents.

PATENTS ACCEPTED.

6645: Cornelius John Shipway and Henry May, both of Meningie, South Australia, Australia, inventors. "Improvements in Sheep Shears." Dated 22nd May, 1902.

6718: Niels Julius Mikkelsen, of Fairview Plantation, Avondale, Bundaberg, Queensland, farmer. "Improvements in Windmills." Dated 7th July, 1902.

6772: William Henry Lawrence, of 35 Melville street, Pollokshields, engineer, and Robert Kennedy, of 346 Pollokshaws road, dairyman, both of Glasgow, Scotland. "Improvements in Milking Apparatus." Dated 25th July, 1902.

6774: Harry Edward Dade, a salesman, of 47 Johnston street, Newburgh, County of Orange, New York, U. S. America. "Improvements in Binders." Dated 28th July, 1902.

6846: Otto Börs, of Coola, Trundle, New South Wales, Australia, grazier. "Improvements in Sheep Shears." Dated 6th September, 1902.

6965: Harry Burgon, of 136 Oakbrook road, Sheffield, York, England, sheep shear manufacturer. "Improvements in the Manufacture of Sheep Shears for Clipping Wool off Sheep or other Animals." Dated, under International Convention, 15th February, 1902. Date of filing, 21st November, 1902.

6784: Robert Featherstone Wells, of 82 William street, Melbourne, Victoria, Australia, shearer. "Improvements in Sheep Shears." Dated 4th August, 1902.

6998: Auguste Gaulin, of Michel Bizot street 170, Paris, French Republic, constructor. "System for Intimately Mixing Milk." Dated 5th December, 1902.

6858: David Davis, of Bunda street, Cairns, Queensland, Australia, moulder, and William James Daniel, of Hartley street, Cairns aforesaid, engineer. "Improved Machine for Planting Sugar-cane and the like." Dated 12th September, 1902.

6803: Annie Sophia Band, of 1 Birtley Place, Elizabeth Bay road, Elizabeth Bay, near Sydney, New South Wales, married woman. "An improved Clip for securing Crossed Wires in Fences, Gates, and Hurdles." Dated 18th August, 1902.

BLUESTONE.

For pickling wheat bluestone is a necessity, and much will now be required. There is a good deal of valueless bluestone annually sold to farmers by unscrupulous vendors. It is, however, very easy to detect the true bluestone or sulphate of copper. This has a crystalline fracture, is very hard, and is of a deep blue colour. The false article is of a pale-blue, green, or even whitish colour, and is very soft. It is of little or no value for pickling wheat. It is not bluestone at all, being merely copperas or greenstone—that is, sulphate of iron. Farmers should only buy bluestone from well-known, respectable firms—not from people who profess to sell the same article at 25 per cent. below the regular market price. If they are "had," they have only themselves to blame.

General Notes.

MILK TESTING.

Hoard's Dairyman says that a new wrinkle in milk testing has just been published. The new method secures a clearer fat column in the Babcock test. In using the test it frequently happens that a grey layer forms at the bottom of the fat column. It is not curd, as it does not act like that body. The presence of the layer prevents a clean reading of the lower edge of the fat column, with a consequent uncertainty of the exact reading. By allowing the test to be chilled in cold water, so that the fat is crystallised, then heating to 140 or 150 degrees and whirling again, a clear column of fat can be obtained.

TREATING BEETROOT.

It is said that a new method of treating beetroot has been patented in Germany by the sugar expert, Karl Steffen. By his process the whole of the sugar is extracted from the beets. It is remarkable that whereas at present the pulp makes good stock feed, after being treated by the new method it has no such value. A factory is being erected at Cologne, on the Rhine, where the new process will be adopted.

WHITE ORANGES.

In a few years white oranges may grace the American dinner table or the Italian fruit waggon. The New York *Tribune* states that one of the explorers of the Agricultural Department discovered this freak of nature on the shores of the Mediterranean, and took some cuttings to the United States. These were carefully grafted on an ordinary stock at the department grounds, and are now 3 feet high. A couple of years will see the first fruit. If it proves of fine flavour, cuttings will be widely scattered.—*Australian Gardener*.

TRAINING VELVET BEANS.

Velvet beans produce such an enormous amount of vines and leaf that strong trellises have to be erected to carry them. Instead of trellises, a Florida farmer, Mr. G. A. Danley, makes use of a new device. This is simply using poles for the vines to climb on. These poles, says the *Florida Agriculturist*, are 12 feet long, buried 3 feet in the ground, and set 6 feet apart in the bean row. The total cost of cutting them and setting them up was £3 per acre.

Last summer there was a most disastrous drought in West Florida, yet Mr. Danley's velvet beans assured him a yield in average seasons of 175 bushels of shelled beans per acre. The beans are worth, locally, from 6s. to 8s. 4d. per bushel for seed.

WATER DIVINING.

An English journal says that the Langholm Town Council has been engaged in boring on White Hill for a water supply. Before commencing operations the council engaged the services of a "water diviner." He indicated thirteen places where water would be found at depths of from 50 feet to 60 feet. When the boring tool reached 51 feet a good supply of water was struck. Scepticism on the subject of the divining rod is rapidly giving place to conversion. Why do not some of those who live in districts dependent on the clouds for water give the matter a trial? Many men and women also have the mysterious gift of being able to discover underground water if they only knew it. Use may be made of a fork of willow, peach, or hazel, the latter for preference.

REDUCING BONES.

The following descriptions of methods by which bones may be more or less readily reduced to powder without the aid of a crushing mill deserve quotation: "A simple plan is to pack the bones, layer by layer, with freshly calcined wood ashes in a barrel and keep the mixture moistened for some months. * * * A quicker method is to boil the bones in an iron or copper boiler with strong caustic lye. The proportion of bones and lye to be used is roughly 15 parts by weight of bones to 5 parts by weight of caustic soda, or 7 parts by weight of caustic potash, dissolved in 15 parts by weight of water. The boiling should be done for two or three hours. But even without boiling, the bones will become disintegrated by being simply kept in the caustic liquor for about a week. Another method of softening bones is by mixing them in heaps with quicklime and loam. A layer of loam 4 inches deep is first spread, and on this is put a layer of bones 6 inches deep, and above this a layer of quicklime 3 inches deep. The layers of loam, bones, and quicklime are repeated until the heap reaches a convenient height, when it is covered all over with a thick layer of earth. Holes are then bored in the heap from the top and water poured down them to slake the lime. This mass will become hot and remain so for 2 or 3 months, after which the bones will become friable, and the whole heap may then be mixed up and spread as manure on land."

RAT TRAPS.

A writer in an English rural paper describes several methods of catching wary old rats. As we are waging war upon rats at present, and the poisoned baits laid for the rodents only seem to whet their appetites for more, we give our readers the benefit of some of the suggested remedies:—

THE DRINKING TRAP.

Sometimes food may be plentiful, but drink not. Rats are thirsty creatures, and if their thirst is not quite up to the degree desired for your purpose, give them a salt herring or two, which will have the desired effect. They are sure then to go to water as evening draws in, and if the water is where a gun can be used the queen of the colony may very likely be made short work of. I have shot many an old crafty one on the way to drink in the evening that I could not circumvent in any other way. And you might improve the water with a little mild poison, though I do not care for poisoning, as a rule.

THE COPPER NECKLET.

Try snaring if there be a run convenient for the operation, and that there likely is somewhere about, because the rat does not spend life under the floor or in the roof. She must and will have a swim now and again. Look round the banks of the adjacent waterhole, or alongside a creek hard by. Set the snare, made of a single copper wire, in a run most used, an inch or so from the ground. Make it secure, and set it in such a position that the victim, when caught, pitches into the water in its struggles to get free. Thus it quickly drowns itself and suffers little. This is a new experience to the creatures, and they may be taken in such a way for a change when a common trap availeth not. Singularly enough, while I have taken a number of full-grown rats in snares, I have never taken any under full growth, and that shows the device is good for taking the most cunning ones.

THE COLD WATER CURE.

This plan is, I believe, quite my own discovery. It is especially useful for taking rats in dwelling-houses, farm buildings, and poultry-houses. It, too, takes the old and more crafty ones. Proceed as follows.—Get a flour or some other suitable barrel and fill it a little above three-parts full of chaff. On this chaff sprinkle a little malt, wheat, oats, or other enticing feed. Even an apple is relished. Your house rat quite craves for this natural food, although it may get plenty of the good things in larder or kitchen. Make it quite convenient for the creatures to visit, ascend and descend the barrel and try contents—even

for them to jump in and out at will. Continue this baiting for a fortnight, and do not be impatient for the *coup de grâce*. But when the nightly feasts have been held for sufficient time take out the chaff from the barrel, fill the latter to corresponding height with water, and put an inch or so of wheaten chaff in the water. Upon the rats' next visitation they will blunder in one after another, not knowing the treachery employed, and, being unable to save themselves, find a watery grave. The very oldest and most cunning get "let in" in this manner quite as easily as the younger and greener ones. But the plan may only be practised about twice successfully in the same quarters.

THE COFFER TRAP.

This is, unfortunately, going out of use. It is a great pity, for it is most effectual in taking the pests when other traps fail. It is made of rough boards, is about 2 feet long, opens at each end, and can be set anywhere. The bait is put inside, and when pulled at down goes the lid or door, and the quarry is taken alive, so that there is absolutely no torturing. Rats have no suspicion that the rough natural boards tacked together can any more be a trap than the old timber they are for ever running about scratching and gnawing. They, however, get a rude awakening. Most old country wheelwrights and gamekeepers used to be able to make these coffer traps, and at trifling expense, and many can now. The traps answer, too, to take all kinds of vermin.

THE LIVING TRAP.

This is the natural device of destruction—the cat. If people troubled with rats, either in house or out, knew how valuable the average cat was in destroying rats and mice, puss would be more highly prized. This I say after having had considerable experience with rats, mice, and cats. Big male cats, or, for choice, castrated males, are the best for killing the biggest rats, and I have had Tommies that destroyed the rats in numbers. Female cats with families kill many of the young rats round about, and now and again an old one, and nip up mice wholesale. Devonshire farmers, than whom there are none more thrifty, keep whole lots of cats about their premises, and find that thus vermin is kept down, and that where the banks round the fields provide the best of breeding ground for the pests.

DESTROYING BREEDERS.

In early spring the old does leave ricks and other winter haunts and go to pond or brook sides to breed. There they arrange to stop for the summer, even until the corn is ripe in the fields. They produce litter after litter rapidly, for no other animals are so prolific. Take, then, your terrier, ferret, and spade, and dig out or otherwise dislodge these does and their nests, and whole families are destroyed. The plan is destructive to a degree, and thus many old offenders are killed that may have bid defiance to all devices of entrapment in days before. One doe killed in spring may save a place being overrun the following winter. I have committed great havoc among the breeders in this way. A good terrier will beat along brookside and find out the holes and nesting-places in the bank, and quickly point them out by barking and scratching. Then ferret or spade, or both, may do the rest.

POWDERED PUFF BALLS.

In our March issue we described a remedy for sore backs in horses, sent to us by a Normanton correspondent. We are now in receipt of a communication from another source, advising caution in using this remedy, because, if the powder accidentally gets into the eyes of the operator it is said to cause permanent blindness.

AGRICULTURAL AND HORTICULTURAL SHOWS.

The Editor will be glad if the secretaries of Agricultural and other Societies will, as early as possible after the fixture of their respective shows, notify him of the date, and also of any change in date which may have been decided on.

Answers to Correspondents.

LUCERNE IN THE NORTH—ORCHARD CULTIVATION.

W. W. MASON, Cairns—

We have no recollection of having seen lucerne grown commercially north of Townsville, although we have been over the whole country between that city, Georgetown, the Gilbert, Cardwell, and a considerable portion of the Cairns, Lower Russell, Mareeba, and Atherton districts. As you state, however, that you have had 21 years' experience at the Far North, you are in a far better position to know whether lucerne is grown, or, if grown, if it is grown on a commercial scale than we are to inform you on the subject. In a moist district such as yours, we should think that weed-growth would be almost a certain bar to success.

The best way of getting rid of a prolific growth of weeds and cultivating between citrus trees is:—

1. To mow the weeds down if they are tall and soft, and if the ground is dry enough to bear horses, plough and harrow.
2. To plough in the weeds, using a chain, as shown in the diagram. The end of the chain (which should be a rather heavy one), instead of being fixed to the end of the beam of the plough as depicted, should be attached to the end of the double swingle-tree, and the loop not be allowed to go farther back than the middle of the mould-board, so as to be clear of the furrow in falling over.

In ploughing between the trees, there is no harm done to the roots. If the soil is well tilled the roots will not be too near the surface. Mr. S. C. Voller, Assistant Instructor in Fruit Culture, ploughs his own orchard from 6 to 8 inches deep. When roots are met with they are cut, not torn out, and no harm results. He has done this for years, and all his trees are healthy and prolific.

PUMPKINS, &c., NOT FRUITING.

P. McKORIE, Fernvale, Gin Gin.—Mr. A. H. Benson says that the cause of the apparent failure of your vines to form fruit is that they are probably too young to form female flowers. The first flowers of pumpkins are usually male flowers.

POISON IN SORGHUM AND AMBER CANE.

NIELS LORENSEN, Mount Beppo.—The investigation on sorghum poisoning is not yet completed. Early amber cane is one of the varieties tested, and the poisonous principle is found in all stages of its growth. Not until the seeds begin to be formed can the crop safely be used for stock.

DISEASE IN HORSES.

CUTHBERT STAPLETON, Gilbert River.—Your letter has been referred to the Chief Inspector of Stock. Mr. Quinnell, M.R.V.S., says in reference to the mortality amongst horses in the Gilbert River district that he cannot improve upon the advice given in his report as to treatment. The only way to solve the *cause* of the mortality is for a duly qualified veterinary surgeon to visit the district. The Chief Inspector of Stock, Mr. P. R. Gordon, says:—"This disease has been pretty well proved to have been caused by the stock eating what is popularly known as the ironwood bush. The older settlers in the district have long known this tree or bush to be poisonous to stock during the months from January to March inclusive."

TOBACCO WASTE.

TOOWOOMBA.—Tobacco waste, *i.e.*, ribs and waste leaf, can be got in large quantities from the tobacco factories at a mere nominal cost of about 5s. per load. Tobacco dust is the same waste ground to the form of snuff, and would have to be specially arranged for. There is no better destroyer of garden slugs than tobacco waste.

HAND ROCK-BORING MACHINE, &c.

CHAS. TUCKER, Atherton—

1. A hand rock-boring machine equal to boring 100 feet through rock (3 to 3½-inch bore) can be obtained from Messrs. Clark and Faucet, Eagle street, Brisbane, for £22 10s. Two men only are required, one to work the lifting wheel, the other to steady the rope.

2. All information concerning Romney Marsh sheep may be obtained from Messrs. Powers, Rutherford, and Co., stock and station agents, Melbourne. Failing your obtaining Romney Marsh sheep, Mr. P. R. Gordon, Chief Inspector of Stock, recommends the Shropshire Downs class.

KAROO BUSH—(PENTZIA VIRGATA).

CHAS. H. WILLIAMS, Barcaldine.—*Pentzia virgata*, or Cape sheep fodder, is recommended for establishment in desert, arid country for sheep feed. Wherever the branches trail on the ground they form new plants, thus enabling the plant to cover the ground rapidly. McCowan states that it is valuable for fixing drift-sand in water-rills, by readily bending over and rooting, thus forming natural little catch dams to retain water.

Sow the seed in boxes or beds prepared for the purpose, and when the seedlings are sufficiently grown, plant out during showery weather. Afterwards the plants may be obtained as abovementioned. The plant has been previously introduced here, but, like many other South African plants, was not found to thrive in our climate.

Very opportunely comes a notice of the Karoo bush in the *South Australian Journal of Agriculture* to the following effect:—

SPEKBOOM (KAROO BUSH.)

The presence of Australian soldiers in the late war in South Africa resulted in considerable attention being directed throughout this and the adjoining States to the fodder bush of the Karoo, generally called "Spekboom." This plant is widely distributed in South Africa, and is greatly valued as food for stock. On the dry Karoo it grows abundantly, particularly on the rough rises and hills. It is exceptionally hardy, succulent, and appetizing to stock that are used to it. The thick stems and small fleshy leaves retain their moisture for a long time under adverse circumstances. The plant grows to a height of 10 feet to 12 feet, and makes quite a large bush; it strikes freely from cuttings, and is said to transplant readily.

In view of its known value in South Africa, the Department obtained from the Cape Department of Agriculture a box of 100 rooted cuttings. These on arrival were placed in charge of Dr. Holtze (Director of the Adelaide Botanic Garden), who has also struck a large number of cuttings from a bush he has growing in the garden. It is proposed to supply several hundred plants to the Eudunda Bureau for trial, on the block of land secured by the Bureau for testing various saltbushes and other drought-resting fodder plants. In order to give an extended trial to the spekboom we have arranged with Dr. Holtze to supply a few rooted plants to any member of the Agricultural Bureau who will undertake to plant them where they can be protected from stock until established.

Applications should be addressed to "The Director, Botanic Garden, Adelaide," and must be accompanied with stamps to the value of 6d. to cover cost of postage.

VINES AND CITRUS TREES SUITABLE FOR CHARTERS TOWERS.,

"AJAX," Charters Towers.—The best grapes for your district are Chasselas doré, or Sweetwater, Black Hamburg, Mrs. Pince Muscat, and Muscat Hamburg. Not many cuttings will be available at the State farms this winter, and the three firstnamed are already all bespoken. The price of cuttings is 3s. per hundred. The most suitable citrus fruit trees for the Towers district are—Washington Navel, Scarlet Mandarin, and Emperor Mandarin. Why import from Sydney when we have nurserymen here who can supply reliable, acclimatised trees, true to name and of the highest quality?

FREEZIA BULBS.

AMATEUR, Hamilton.—I am told that freezias are very sweet-scented flowers and that they grow from a bulb. When can I plant these bulbs?

During March and April. They are very sweet-scented, and require very little care beyond keeping them clear of weeds. Any Brisbane seedsman can supply you with bulbs.

BI-SULPHIDE OF CARBON.

J. HARDCASTLE, Dugandan.—Most authorities say that bi-sulphide injures the germ of grain—that is, if used very freely. We know of farmers who have used it in moderation, and they say it has no ill effect on the germinating power of the grain. Why not make a small experiment and satisfy yourself on the point?

PERSIMMON TREES.

C. N., Runcorn.—Mr. A. H. Benson advises that it will be more profitable to plant fresh trees than to remove the old ones.

VALUE OF VANILLA.

T. J., Geraldton.—The latest price lists give the value of vanilla in the home market at from 3s. to 7s. per lb.

GRAPE NUTS.

H. E. MEYERS, Brooloo, Gympie.—The clippings you send show that grape nuts are merely some form of manufactured cereal, like pearl barley or rolled oats. It is stated in one advertisement that it is merely "ready-cooked porridge." Mr. F. M. Bailey, Colonial Botanist, says there is no such fruit as the grape nut.

PRICES OF FARM STOCK IN THE JOHNSTONE RIVER DISTRICT.

PIONEER.—The price of horses on the Johnstone, we are informed, is from £15 to £16 per head. Milking cows yielding from 8 to 10 quarts of milk daily are worth from £7 to £8 10s. per head. Sheep do not succeed on the coast land, and quotations could only be given for butchers' sheep.

RUSTED TANK.

GRAZING FARMER, Miles.—There is no remedy for the rust in your tank. We lost two tanks at Brisbane in the same manner. The explanation given by a plumber was, that some of the sheets of iron were not properly tinned, and where this occurred, the iron would quickly rust through, and, as you say, you can scratch holes in it with the finger nail. If only one or two sheets are so affected, they might be removed and fresh sheets put in.

BACON WEEVILS.

G. CHAPMAN, North Kolan.—The following will be found to be an effectual method of protecting bacon from weevil:—Make a solution of quicklime, to which add a quantity of borax. In this solution place strong calico; sew the bacon up in this, and hang in a dry place.

The Markets.

TOP PRICES FOR FRUIT—ROMA-STREET MARKETS.

Article.	MARCH.	
	Top Prices.	
Apples, Eating	8s.	6d.
Apples, Cooking	8s.	
Apples, American, Eating		
Apples, American, Green		
Lemons, Italian, per 360	22s.	6d.
Lemons, Italian, per 180	12s.	
Lemons, American, per 180		
Lemons, New South Wales	12s.	
Oranges, Italian	10s.	6d.
Oranges, Local	6s.	
Mandarins, Local (indifferent)	2s.	6d.
Apricots, New South Wales, boxes (half-gincase)		
Apricots, Queensland, half-case		
Plums, quarter-case	5s.	
Peaches, half-gincase	6s.	
Nectarines, half-gincase		
Gooseberries, English		
Cherries		
Passion Fruit, quarter-case	2s.	6d.
Mangoes		
Pineapples, rough	3s.	9d.
Pineapples, Queen	6s.	
Melons, per dozen	2s.	
Rockmelons	2s.	6d.
Bananas, per bunch	1s.	3d.
Bananas, per dozen	2½d.	
Pears (Tasmanian), quarter-case	6s.	
Pears (Victorian), half-case	8s.	6d.
Grapes (South Australian), case	8s.	
Persimmons, half-gincase	5s.	6d.
Custard Apples, half-gincase	4s.	6d.

AVERAGE TOP PRICES FOR MARCH.

Article.	MARCH.	
	Top Prices.	
	£	s. d.
Bacon lb.	0	0 11½
Bran ton	6	16 3
Butter, First lb.	0	1 1½
Butter, Second "	0	0 10¼
Chaff, Mixed ton	5	13 9
Chaff, Oaten "	6	10 0
Chaff, Lucerne "	5	6 3
Chaff, Wheaten "	5	10 0
Cheese lb.	0	0 8
Flour ton	13	0 0

AVERAGE TOP PRICES FOR MARCH—continued.

Article.							MARCH.	
							Top Prices.	
							£	s. d.
Hay, Oaten	...	...	...	...	...	ton	5	10 0
Hay, Lucerne	...	...	...	...	...	"	4	0 0
Honey	...	...	...	...	...	lb.	0	0 2 $\frac{1}{2}$
Rice, Japan (Duty paid)	...	...	...	...	...	ton	22	10 0
Maize	...	...	...	...	...	bush.	0	4 9 $\frac{3}{4}$
Oats	...	...	...	...	...	"	0	4 2
Pollard	...	...	...	...	...	ton	8	15 0
Potatoes	...	...	...	...	...	"	5	5 0
Potatoes, Sweet	...	...	...	...	...	"	2	2 6
Pumpkins	...	...	...	...	...	"	2	1 9
Sugar, White	...	...	...	...	...	"	21	10 0
Sugar, Yellow	...	...	...	...	...	"	17	0 0
Sugar, Ration	...	...	...	...	...	"	13	7 6
Wheat	...	...	...	...	...	bush.	0	6 6
Onions	...	...	...	...	...	cwt.	0	5 0
Hams	...	...	...	...	...	lb.	0	1 0 $\frac{1}{2}$
Eggs	...	...	...	...	...	doz.	0	1 2 $\frac{1}{2}$
Fowls	...	...	...	...	...	pair	0	4 3 $\frac{3}{4}$
Geese	...	...	...	...	...	"	0	6 1 $\frac{1}{2}$
Ducks, English	...	...	...	...	...	"	0	4 6 $\frac{1}{4}$
Ducks, Muscovy	...	...	...	...	...	"	0	5 10
Turkeys, Hens	...	...	...	...	...	"	0	7 6
Turkeys, Gobblers	...	...	...	...	...	"	0	17 6

ENOGGERA SALES.

Article.										MARCH.		
										Top Prices.		
										£	s.	d.
Bullocks	...	...	...	...	...	...	...	...	...	10	10	0
Cows	...	...	...	...	...	...	...	...	...	7	14	6
Wethers, Merino	...	...	...	...	...	...	...	...	...	1	0	3
Ewes, Merino	...	...	...	...	...	...	...	...	...	0	17	0
Wethers, C.B.	...	...	...	...	...	...	...	...	...	0	18	3
Ewes, C.B.	...	...	...	...	...	...	...	...	...	0	15	6
Lambs	...	...	...	...	...	...	...	...	...	0	15	11
Baconers	...	...	...	...	...	...	...	...	...	2	9	0
Porkers	...	...	...	...	...	...	...	...	...	1	15	2
Slips	...	...	...	...	...	...	...	...	...	0	10	0



Times of Sunrise and Sunset, 1903.

DATE.	MAY.		JUNE.		JULY.		AUGUST.		PHASES OF THE MOON.
	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.	
1 ...	6:16	5:14	6:33	4:58	6:43	5:0	6:33	5:14	4 May) First Quarter 5 26
2 ...	6:17	5:13	6:33	4:58	6:43	5:0	6:32	5:15	11 " ○ Full Moon 11 18
3 ...	6:18	5:12	6:35	4:57	6:43	5:1	6:31	5:16	19 " ☾ Last Quarter 1 18
4 ...	6:18	5:12	6:35	4:57	6:43	5:1	6:30	5:17	27 " ● New Moon 8 50
5 ...	6:19	5:11	6:36	4:57	6:43	5:1	6:30	5:18	1 " Perigee 3 0
6 ...	6:19	5:10	6:36	4:57	6:43	5:1	6:30	5:18	
7 ...	6:20	5:9	6:36	4:57	6:43	5:1	6:28	5:19	
8 ...	6:21	5:8	6:37	4:57	6:43	5:2	6:27	5:19	2 June) First Quarter 11 24
9 ...	6:21	5:6	6:37	4:57	6:43	5:2	6:27	5:19	10 " ○ Full Moon 1 8
10 ...	6:22	5:6	6:38	4:57	6:43	5:3	6:26	5:20	18 " ☾ Last Quarter 4 44
11 ...	6:22	5:6	6:38	4:57	6:43	5:3	6:25	5:20	25 " ● New Moon 4 11
12 ...	6:23	5:5	6:38	4:57	6:43	5:4	6:24	5:21	
13 ...	6:24	5:5	6:39	4:57	6:42	5:4	6:23	5:22	
14 ...	6:25	5:4	6:39	4:57	6:41	5:5	6:23	5:23	2 July) First Quarter 7 2
15 ...	6:25	5:3	6:39	4:57	6:41	5:7	6:21	5:23	10 " ○ Full Moon 3 43
16 ...	6:25	5:3	6:39	4:57	6:41	5:7	6:21	5:23	18 " ☾ Last Quarter 5 24
17 ...	6:26	5:2	6:40	4:58	6:41	5:7	6:20	5:24	24 " ● New Moon 10 46
18 ...	6:26	5:2	6:40	4:58	6:41	5:7	6:20	5:24	31 ") First Quarter 5 15
19 ...	6:26	5:2	6:40	4:58	6:41	5:7	6:20	5:24	
20 ...	6:27	5:1	6:41	4:58	6:40	5:8	6:18	5:24	
21 ...	6:27	5:1	6:41	4:58	6:40	5:8	6:17	5:25	
22 ...	6:27	5:1	6:41	4:58	6:39	5:9	6:16	5:26	8 Aug. ○ Full Moon 6 54
23 ...	6:29	5:1	6:42	4:58	6:38	5:10	6:15	5:27	16 " ☾ Last Quarter 3 22
24 ...	6:29	5:1	6:42	4:58	6:38	5:10	6:14	5:27	23 " ● New Moon 5 51
25 ...	6:30	5:0	6:42	4:58	6:37	5:11	6:13	5:27	30 ") First Quarter 6 34
26 ...	6:30	5:0	6:42	4:58	6:37	5:11	6:13	5:27	
27 ...	6:30	5:0	6:42	4:58	6:37	5:11	6:12	5:28	
28 ...	6:31	4:59	6:43	4:59	6:36	5:12	6:11	5:30	
29 ...	6:31	4:59	6:43	4:59	6:36	5:12	6:10	5:30	
30 ...	6:32	4:58	6:43	5:0	6:35	5:13	6:7	5:31	
31 ...	6:32	4:58	...	...	6:34	5:14	6:6	5:31	

Orchard Notes for May.

By ALBERT H. BENSON.

The hints given in the notes for March and April on the gathering, handling, and marketing of citrus fruits apply equally to the present month, with this difference, however, that even more care is required, as the riper citrus fruits become, the more readily are they bruised and injured. May being usually a more or less dry month on the coast, the opportunity should be taken of cleaning up all weeds and rubbish that may have accumulated during the summer and autumn, and getting the surface of the land into a good state of cultivation, so that the comparatively small rainfall of the winter months may be conserved in the soil for the trees' growth. Unless this is done, fruit trees, especially citrus, are apt to suffer, especially if growing on shallow or badly drained soil with a retentive subsoil. Where not already done, all dead or worthless trees should be dug out; and if fresh trees are to be planted in the same place, then the holes from which the trees have been taken should be allowed to remain open, and the soil should be well exposed to the action of the atmosphere and be well sweetened. Land intended for planting during the winter should be got ready, more especially if it is new land, as it is a mistake to delay the preparation of the land too much, or to plant the trees in a raw, unsweetened, and improperly prepared land. What planting has to be done, see that it is done well, as an acre of land properly prepared will pay better than twice or three times that quantity treated anyhow.

Towards the end of the month, slowly soluble manures, such as boiling-down refuse or coarse bones, may be applied to the land, as they will become slowly available; and when the spring growth starts, the trees will get the benefit. Quickly soluble manure should not be applied now, but should only be used during a period of active plant growth, otherwise they are apt to be lost. Where possible, don't destroy the weeds and refuse of an orchard unless the same is diseased, or is likely to form a harbour for injurious insects, but rather form it into a compost heap, preferably with lime, and allow it to become well rotten, when it will be found to be a valuable manure for citrus and other trees in many soils; as, though our soils, as a rule, are great producers of weeds, many are actually deficient in vegetable matter, so that it is a mistake to burn off all weeds, grass, or other rubbish. This deficiency of organic matter in the soil is a serious consideration, as soils deficient in organic matter are usually deficient in nitrogen, and also they are deficient in the power to retain moisture—a matter of extreme importance in a country like this, where we are subject to such long spells of dry weather.

In the colder districts the pruning of deciduous trees may be commenced towards the end of the month, but in other parts of the State it is better to wait longer, as the leaves are not off and the sap is not down. Pineapples, where at all subject to frost, should receive a light covering of grass or other similar material as a protection, or, where practicable, as in the case of scrub lands, subject to light frost, they should be covered with a light framework covered with palm leaves or similar material.

Palm stems or saplings resting on forked posts, placed on either side of the bed to be protected, make a good framework; and with palm-leaves, tea-tree bush, or other similar material laid across from sapling to sapling, a very cheap and efficient protection against frost is obtained.

Gather and destroy all infested guavas, oranges, custard apples, &c., so as to destroy the larvæ of any fruit flies or peach moths that may be in them, as if these insects are well killed down now there will be many less to deal with next spring, and there is a chance of the earlier fruits being harvested without much loss.

Farm and Garden Notes for June.

FARM.—Although frosts will, in all probability, have already occurred in some exposed parts of the South-western districts, yet winter does not practically begin until the 24th of the month. Insect life is now dormant, and weeds are no longer a serious trouble to the farmer. Hence, now is his time to sow lucerne. Sometimes a dropping season in May will start a growth of weeds, but this should not act as a deterrent, as the lucerne will in all likelihood overcome the now slow-growing weed crop. Rye, prairie, and other grasses may also now be sown.

Those who propose to sow millets, sorghum, r. nicum, &c., should begin to get the land ready for these crops. Oats, rye, barley, vetches, clover, tobacco, buckwheat, and field carrots and swedes may now be sown. Some advocate the sowing of early maize and potatoes towards the end of the month, but obviously this can only apply to the more tropical parts of Queensland. The land may be got ready, but in the Southern district and on the tableland neither maize nor potatoes should be got in before the end of July or in August. There is always a probability of frosts during these months. Arrowroot will be nearly ready for digging, but the bulbs should not be taken up until the first frosts have occurred. Dig sweet potatoes, yams, and ginger. Sweet potatoes may be kept, should there be a heavy crop, and consequently a glut in the market, by storing them in a cool place in dry sand, taking care that they are thoroughly ripe before digging. The ripeness may be known by the milky juice of a broken tuber remaining white when dry. Should the juice turn dark, the potato is unripe, and will rot or dry up and shrivel in the sand pit. Before pitting, spread the potatoes out in a dry barn, or in the open if the weather be fine. In pitting them or storing them in hills, lay them on a thick layer of sand. Then pour dry sand over them till all the crevices are filled and a layer of sand is formed above them. Then put down another layer of tubers, and repeat the process till the hill is of the requisite size. The sand excludes the air, and the potatoes will keep right through the winter. Wheat may still be sown. It is too late for a field crop of onions. In tropical Queensland the bulk of the coffee crop should be off by the end of July. Yams may be unearthed. Cuttings of cinnamon and kola-nut tree may be made, the cuttings being planted under bell glasses. Collect divi-divi pods and tobacco leaves. English potatoes may be planted. The opium poppy will now be blooming and forming capsules. Gather tilseed (sesame), and plant out young tobacco plants if the weather be suitable. Sugar-cane cutting may be commenced. Keep the cultivator moving amongst the pineapples. Gather all ripe bananas. Fibre may be produced from the old stems.

KITCHEN GARDEN.—Asparagus and rhubarb may now be planted in well-prepared beds or rows. In planting rhubarb, it will probably be found more profitable to buy the crowns than to grow them from seed; and the same remark applies to asparagus.

Cabbage should be planted out as they become large enough; also cauliflower, lettuce, &c.

Sow cabbage, red cabbage, peas, lettuce, broad-beans, carrots, radish, turnip, beet, leeks, and herbs of various kinds such as sage, thyme, mint, &c. Eschalots, if ready, may be transplanted; also horse-radish can be set out now.

The earlier sowings of all root crops should now be ready to thin out, if this has not been already attended to.

Keep down the weeds among the growing crops by a free use of the hoe and cultivator.

The weather is generally dry at this time of the year, so the more thorough the cultivation the better for the crops.

Land for early potatoes should now be got ready by well digging or ploughing.

Tomatoes intended to be planted out when the weather gets warmer may be sown towards the end of the month in a frame where the young plants will be protected from frost.

FLOWER GARDEN.—No time is now to be lost; for many kinds of plants need to be planted out early to have the opportunity of rooting and gathering strength in the cool moist spring time to prepare them for the trial of heat they must endure later on. Do not put your labour on poor soil. Raise only the best varieties of plants in the garden; it costs no more to raise good varieties than poor ones. Prune closely all the hybrid perpetual roses, and tie up, without pruning, to trellis or stakes the climbing and tea-scented varieties, if not already done. These and other shrubs may still be planted. See where a new tree or shrub can be planted; get these in position; then they will give you abundance of spring bloom. Renovate and make lawns, and plant all kinds of edging. Finish all pruning. Divide the roots of chrysanthemums, perennial phlox, and all other hardy clumps; and cuttings of all the summer bedding plants may be propagated.

Sow first lot, in small quantities, of hardy and half-hardy annuals, biennials, and perennials, some of which are better raised in boxes and transplanted into the open ground, but many of this class can, however, be successfully raised in the open border if the weather is favourable. Antirrhinum, carnation, picotees, dianthus, hollyhock, larkspur, pansy, petunia, *Phlox Drummondii*, stocks, wallflower, and zinnias, &c., may be sown either in boxes or open beds; mignonette is best sown where it is intended to remain.

To grow these plants successfully, it is only necessary to thoroughly dig the ground over to a depth of not less than 12 inches, and incorporate with it a good dressing of well-decayed manure, which is most effectively done by a second digging; the surface should then be raked over smoothly, so as to remove all stones and clods, thus reducing it to a fine tilth. The seed can then be sown in lines or patches as desired, the greatest care being taken not to cover deeply; a covering of not more than three times the diameter of larger seeds, and a light sprinkling of fine soil over small seeds, being all that is necessary. A slight mulching of well-decayed manure and a watering with a fine-rosed can will complete the operation. If the weather prove favourable, the young seedlings will usually make their appearance in a week or ten days; thin out so as to leave each plant (if in the border) at least 4 to 6 inches apart.

Plate XXVI.



IRRIGATION AT QUNABA, BUNDABERG.

Agriculture.

IRRIGATION AT BUNDABERG.



IN pursuance of the course of inquiry into the means adopted for artificial irrigation in this State, and the results therefrom arising, I visited the Bundaberg district, where irrigation was commenced by Messrs. Gibson and Howes, at Bingera, on the extensive scale already described in this *Journal*. The first property visited was Qunaba, one of the properties owned by the Queensland National Bank. The general manager, Mr. J. A. Eastick, extended the utmost courtesy to me, and did all in his power to enable me to clearly understand what has been and is being done in the matter of cane-growing by irrigation.

In connection with Qunaba are five properties, named respectively Davidson's, Summerville, Windsor, Sherwood, and the Grange. The total area under cane cultivation on these properties, including Qunaba, is 1,492 acres. Another plantation, Rubiana, irrigates about 500 acres, and the plant would possibly be equal to watering 1,000 acres.

QUNABA.

is about twelve miles from Bundaberg. Although there is much that is interesting to see, both here and at the headquarters—Millaquin—in the way of sugar machinery, &c., we are now only concerned with the question of water supply and distribution. The first important matter to note is, the quality of the water. By analysis, the subterranean water at one well on this plantation shows 100 grains of chlorides and 64 grains of organic matter. This means that the water is brackish, although the amount of chlorine does not come within 18 or 20 grains of the danger point, in so far as it affects the health of the cane. This point having been ascertained, the next step was to consider whether the soil was of such a nature that water of this quality could be safely applied. It is very important that the characteristic properties of porous red and retentive black soils should be thoroughly understood, in order that the best results may be obtained. It should have before been stated that about December, 1900, Dr. Maxwell was informed that a small well on the Qunaba Estate, sunk by the previous owner, Mr. J. Barton, was yielding 4,000 gallons of water per hour, thus bearing out Dr. Maxwell's statement in his official report to the then Minister for Agriculture, the late Hon. J. V. Chataway, that the indications were that underground water would be found beneath the coastal lands in the Woongarra-district, and at very shallow depths, near to the sea. When, at Dr. Maxwell's instance, this well was deepened, it yielded 53,000 gallons per hour. The doctor at once had an interview with the general manager of the Queensland National Bank, Mr. J. V. Ralston, and advised him to visit Qunaba and see for himself what was being done in the direction of obtaining subterranean water. Mr. Ralston went to Qunaba, and the result was, he decided to advise the directors to expend a certain sum in prospecting for water. This was determined on up to a certain fixed limit, and the result was that, owing in a large part to the interest taken and the careful working of the then manager, Mr. J. Cran, and his capable engineer, Mr. MacWalter, the end was gained at an expenditure of one-tenth of the sum set apart for the purpose by the owners of the estate.

A new shaft was sunk and larger bores were driven down into the water-bearing stratum, and it proved a splendid success. As soon as the bores pierced the clayey stratum and entered the gravel water-stratum, the water rushed up with enormous force, rising some 14 feet above its confined level. A pump was put down, worked by a Fowler ploughing engine. The pump at the old well was kept running at full power at the same time. The united service of the

two pumps was a total of 70,000 gallons per hour, or 1,680,000 gallons in twenty-four hours, and without any effect upon the quantity or quality of the water, the quality being carefully controlled by the laboratory. The water is found and rises to within 28 feet of the land surface; and, as for the supply, there is ample for the irrigation of the entire Qunaba Estate, whilst the indications go to show that there is a supply for more extended uses in the Woongarra district.

On the 29th October, 1902, the general manager of the Millaquin estates communicated with Dr. Maxwell, Director of the Sugar Bureau, at Bundaberg, forwarding him the analysis of the water from another well, the mill well at Qunaba. To this Dr. Maxwell replied that for general irrigation use—that is, to be applied in the regular quantities—it would be a very great risk to use it, and especially upon cane seed or very young cane. Where the cane has already a good hold upon the ground, small quantities—say, 1 inch per acre—would not immediately do injury, and later rains will carry out the excess of accumulated salt. For seed just planted, enough might be applied to give the cane a start. It would be advisable, however, not to put the water right on top of the seed, but to apply it in small trenches about a foot away. If applied upon the seed, the salt could accumulate sufficiently to prevent germination or injure the young cane. The red soils (such as that at Qunaba), being sweet soils, they will bear more water that is decidedly brackish than low, sour soils, which already contain moderate amounts of salt. Yet in any soil such water requires to be used with very great care.

Of course, Dr. Maxwell has always in view the ulterior effect of using brackish water on soils if expedient, many examples having shown him that the water, which will not injure a first crop, can ultimately salt the ground and render it unfit for future plant growth. Lime chloride is even worse than sodium chloride in its effect upon plant organism.

It will be clear from the above that neither of the eminent authorities on soil and water analysis disagreed on the vital point that water of a certain brackishness might be safely applied in small quantities on a porous red soil. The particular field under consideration was, therefore, planted, notwithstanding that the season was too far advanced, and experienced planters in the district gave it as their opinion that this fact, combined with the irrigation with such brackish water, would render the experiment a failure.

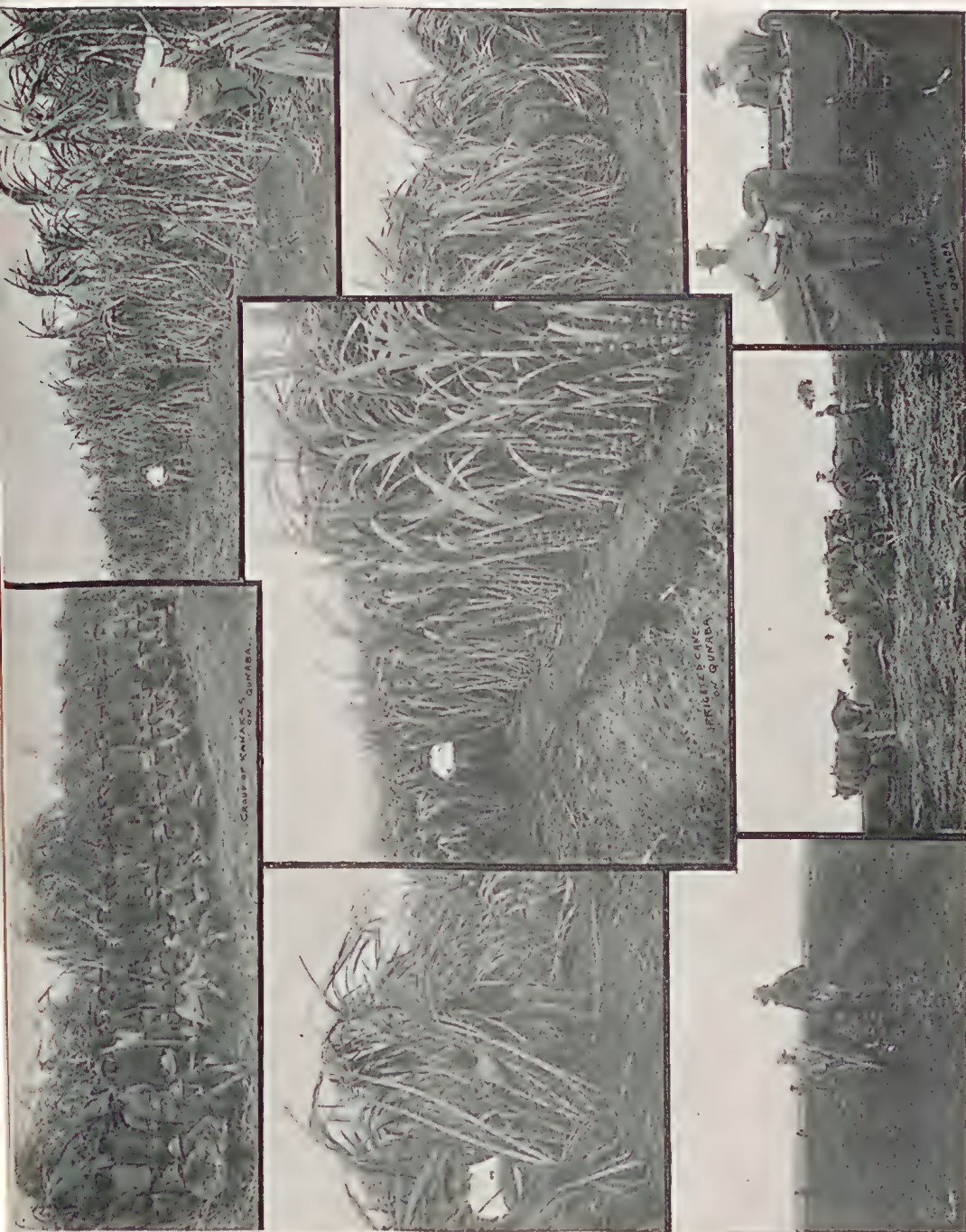
METHOD OF APPLYING THE WATER.

The water is carried to the head of the field by the usual method of flumes and ditches, whence it is put on to the field along the cane rows. All necessary work now has to be done by hand, so as to preserve the channels. Running the water along the cane rows in the early stages reduces considerably the amount of water required; but with a heavy crop, on account of the difficulty of working the channels and blocks, the amount required by the red soil is very excessive, the quantity reaching 125,000 gallons per acre at each watering. There is here a very important note to be made, which I have not seen mentioned before, and that is: Supposing the soil has a tendency to form a hard pan, then watering *between* the rows is preferable. In applying the water in this manner, instead of *along* the rows, the water, in percolating, takes up a quantity of plant food and carries it to the roots.

Having given the above brief history of the method of dealing with the irrigation of a particular field of cane with brackish water, I will conclude by giving the results so far as can be seen at present. The daily average of water applied during two weeks was 26,500 gallons per hour, and the cane, as will be seen by the illustration, presents a magnificent appearance, promising from 50 to 60 tons per acre.

THE AMOUNT OF WATER APPLIED ON QUNABA AND DAVIDSON'S on young plant cane in the early stages was 8,000,000 gallons per week. At the time of this writing, the quantity had risen to 12,000,000 gallons per week—*i.e.*, 45,000 gallons and 73,000 gallons respectively per acre, or, in the early stages,

Plate XXXII.



CANE CULTIVATION BY IRRIGATION AT QUNABA, BUNDEBERG.

1½ inches, and now 3 inches per acre; during an interval of seven months, from January to August,

THE COST OF APPLICATION OF WATER

reaches £1 17s. 6d. per million gallons weekly. The cost of well-sinking amounts to 34s. for rock and 14s. for soil per foot. The number of "boys" required to look after the irrigation channels on Qunaba is on an average 1 boy to 2.7 acres, and on Davidson's 1 boy to 1.9 acres. This was the average for 3 weeks. The cane most generally grown is Rappoe. I saw a few stools of the old Queensland favourite, the Bourbon, which was destroyed many years ago by rust. These plants, however, were looking remarkably healthy. The non-irrigated part of Qunaba is managed by Mr. S. Glass, whilst the irrigated part is attended to by Mr. P. J. Murphy. Mill manager at Qunaba, Mr. C. J. MacWalter; chemist, Mr. W. H. S. Howe. There are 130 kanakas on the plantation. During the season the total number of hands required amounts to between 400 and 500 whites and coloured labour.

Estimated Cost of Irrigating Plant and Cost of Working per Acre.

Estimate of cost of irrigating plant for 260 acres. Well on highest point of land. Pumps working twenty-four hours per day. Capacity, 66,000 gallons per hour:—

Sinking Well.—Average cost, 34s. for rock and 14s. for soil per foot. Basis, 80-foot well	...	...	...	...	£106	0	0
Pump.—Equal to 66,000 gallons per hour to a head of 200 feet	...	...	...	...	350	0	0
Boiler.—With economiser, buildings, &c.	...	...	...	...	500	0	0
Fixing pump in well and timbering	...	...	...	...	40	0	0
Suction and discharge piping	...	...	...	...	30	0	0
Total cost	...	...	...	...	£1,026	0	0

Average cost per acre, £3 8s. 11d.

Cost of Working Expenses per Year.

Assuming forty-eight weeks worked per year.

Fuel.—Two tons per day at 12s., £1 4s.	...	...	...	...	£345	12	0
Wages.—Two men at £2 3s. per week	...	...	...	...	206	8	0
Total	...	...	...	...	£552	0	0

Average cost of working per acre, £2 2s. 6d.

Average cost per acre, including working expenses, £6 1s. 5d.

Where pump is fixed some distance from highest point of land, as at Qunaba:—

Above cost without piping	...	...	...	...	£1,578	0	0
Cost of piping	...	...	...	...	987	0	0
Field fittings, &c.	...	...	...	...	50	0	0
Labour, pipe laying, lead, material, &c.	...	...	...	...	70	0	0
Two dams, capacity 500,000 gallons each	...	...	...	...	144	0	0

Total £2,829 0 0

Average cost per acre, £8 15s. 1d.; or, including working expenses, £10 17s. 7d.

Estimated Cost of Irrigating Plant for Fifty Acres. Well on Highest Point of Land.

Sinking Well.—Average cost, 34s. for rock, 14s. for soil, per foot. Basis, 80-foot well	...	...	...	...	£106	0	0
Pump.—Equal to 14,000 gallons per hour	...	...	...	...	200	0	0
Boiler.—Economiser, buildings, &c.	...	...	...	...	400	0	0
Fixing pump in well	...	...	...	...	40	0	0
Suction and discharge piping	...	...	...	...	30	0	0
Total	...	...	...	...	£776	0	0

Average cost per acre, £15 10s. 5d.

Cost of Working Expenses per Year.

Assuming forty-eight weeks worked per year.

Fuel.—18s. per day of twenty-four hours	...	...	...	259	4	0
Wages.—One man at £2 3s. per week	...	...	...	103	4	0
Total	...	...	...	£362	8	0

Average cost per acre of working, £7 5s.

The above was the total estimated cost of the irrigation scheme. The completed work shows that Davidson's well supplies 80,000 gallons, and with a pump of the Snow type irrigates 300 acres, the cost amounting to £832.

The mill well, with a duplex Worthington pump, irrigates 250 acres, at a cost of £2,057. At Waterview, to be presently described, with the gang-well installation, and with two vertical engines at the first station, a 10-inch centrifugal pump by J. and A. Gwynne, and an 8-inch delivery pipe, 200 acres are irrigated with 45,000 gallons of water per hour, the total cost being £760.

It would seem that where the tube-well system is installed both the cost of installation and the working expenses are less than where shaft wells are sunk, the initial expenses being less, and the lift merely a fraction of that of the deep-well system.

OAKWOOD.

This property is managed by Mr. C. P. Adams, who also has charge of Waterview Plantation. At Oakwood there is no irrigation carried on. The property comprises 680 acres of land, beautifully situated on the Burnett River; 325 acres are under cane. Mr. Adams formerly managed Rubiana. He has been good enough to furnish me with the accompanying details of the rainfall at Oakwood during the past twenty years. This is a very valuable record, and is a striking commentary upon the unwisdom of depending on cloud water for cane or any other crops:—

Year.			Amount Fallen.		Year.			Amount Fallen.	
			Inches.	Points.				Inches.	Points.
1883	...	...	25	32	1893	...	...	91	30
1884	...	...	40	04	1894	...	...	57	30
1885	...	...	33	67	1895	...	...	57	87
1886	...	...	50	20	1896	...	...	54	01
1887	...	...	62	13	1897	...	...	45	21
1888	...	...	33	61	1898	...	...	72	02
1889	...	...	48	58	1899	...	...	44	70
1890	...	...	51	06	1900	...	...	30	55
1891	...	...	50	09	1901	...	...	34	67
1892	...	...	52	29	1902	...	...	15	41

Average, 47·26 per annum.

From 1st January to 30th April, 1903 = 10·29 inches.

RUBIANA.

Five hundred acres are irrigated here, and the land lies so favourably that probably 1,000 acres could be irrigated without much additional expense.

WATERVIEW.

on the north side of the Burnett River, opposite to Millaquin, is reached in about two miles after crossing the bridge. There is a large quantity of well-grown young cane here, and 200 acres are under irrigation. The heavy rains at the time of my visit had placed the tube-well pipes under water, as was indeed the case everywhere; these wells, being sunk several feet below the bottom level of a deep trench to avoid a high lift, are always liable to be inundated during heavy rains. There are two pumping stations on the property, which fill large dams of considerable capacity, whence the water is led by means of drains and flumes to the fields. All the irrigated cane is looking well, but it will be at least four months before crushing can take place.

FAIRYMEAD.

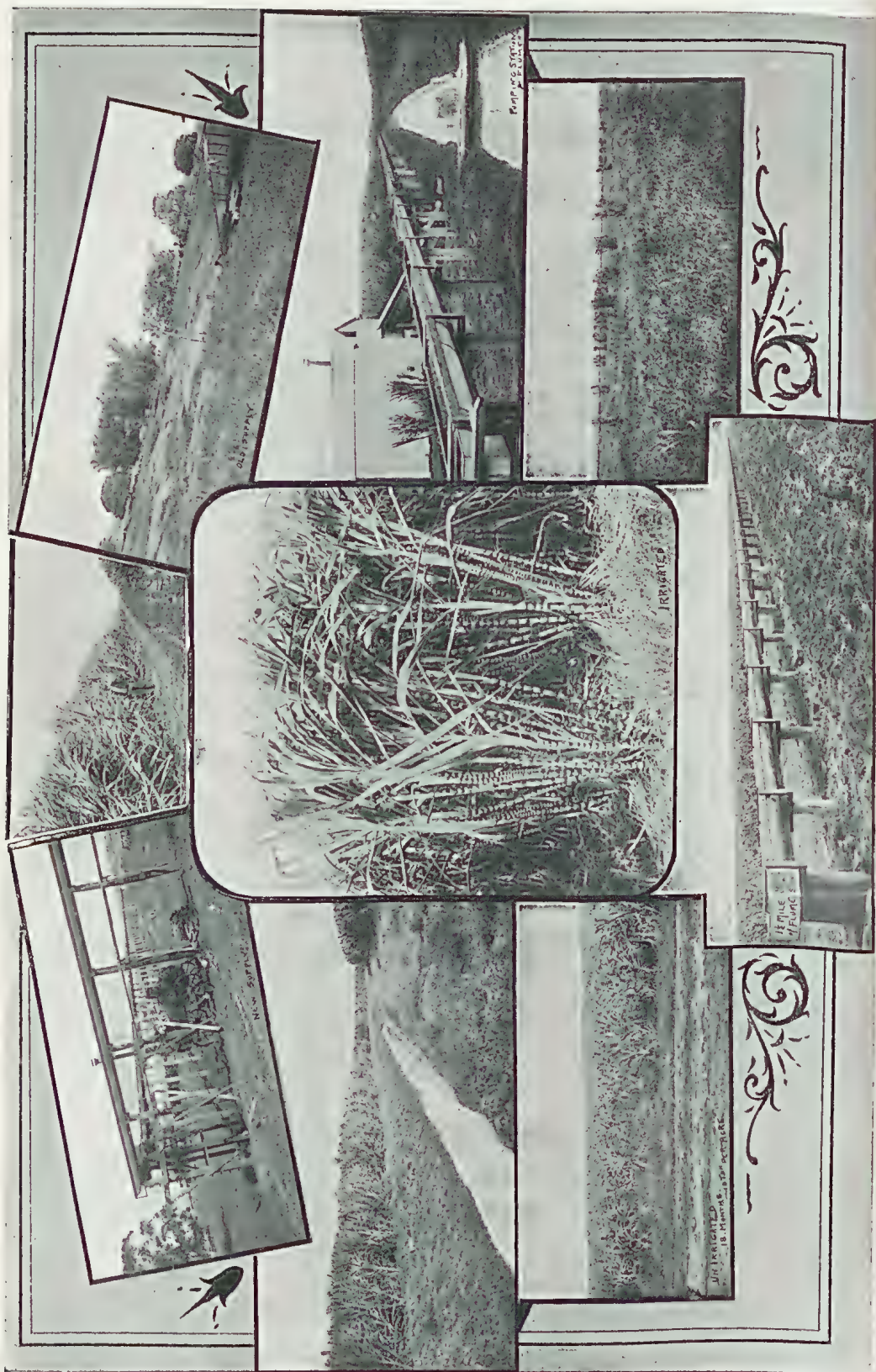
This estate is one of the finest properties in the Southern sugar-growing districts, and has been carried on by the proprietors, Messrs. Young Bros., through all the vicissitudes of flood, drought, legislation, and labour troubles

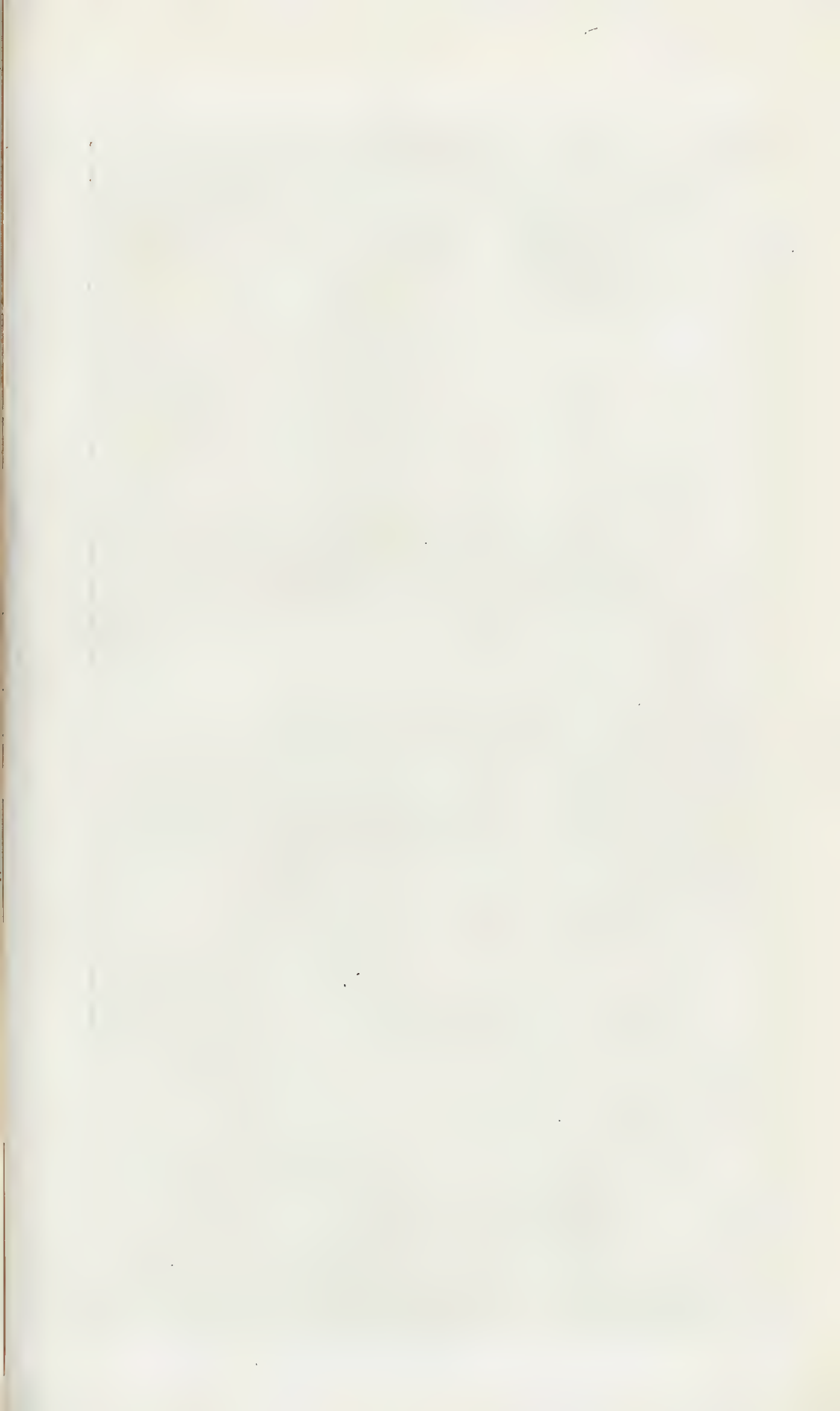
Plate XXXIII.



IRRIGATION AT OAKWOOD AND WATERVIEW, BUNDABERG.









VIEWS AT FAIRYMEAD PLANTATION, BUNDABERG.

arising therefrom, and all the other ills the sugar industry has been subjected to since the late Hon. Louis Hope started the first plantation at Cleveland, and imported the first kanakas into Southern Queensland. Of the 2,280 acres under cane, 1,500 to 1,600 are under irrigation. During the drought, the proprietors saw all their hopes of even light crops dwindling away. On the other hand, they saw 1,000 acres of magnificent cane flourishing on a neighbouring plantation as if by the help of the black art. But there was no necromancy about the matter. The great magician was Aquarius, the water-man. Mr. Young recognised that, if the sugar industry was to prosper, artificial irrigation must be resorted to wherever sufficient water could be obtained for the purpose. A remarkable thing happened about this time. Mr. Young had seen the result of Dr. Maxwell's discovery of subterranean water at Qunaba, and whilst he was on a trip south the engineer at the Fairymead Mill, who had seen water obtained in America by means of a pipe driven into the water-bearing strata, prepared a spear-head and drove it into the ground. On its reaching the subterranean water, hitherto unsuspected, the water rose in it to the top. On this valuable discovery being made, Mr. Young paid a visit to the Burdekin, where he was so impressed with the great value of the tube-well system there that on his return a commencement was made of the splendid irrigation scheme by which the moribund fields were transformed into the beautiful areas waving with magnificent cane such as are now to be seen on the plantation. The illustrations show the wonderful contrast between the cane before irrigation and after. Had no water been available, there would not have been a stick of cane fit for the mill this year. Now there are between 1,500 and 1,600 acres of as magnificent cane as ever rejoiced a planter's heart, and which will produce from 30 to 60 tons, and possibly more, per acre.

Once the installation of pumping stations was begun, the work was vigorously carried out, till now there are nine at work, and everything is ready to start two more as soon as the pumps arrive. These nine stations may be described thus:—

Station.	Tubes (2 in.)	Centrifugal Pumps.	Engines.	Output per Hour.
No.		Inches.		Gallons.
1	20	8	6 h.p. portable	60,000
2	36	10	10 h.p. vertica	100,000
3	24	8	12½ B. h.p. oil	50,000
4	24	8	6 h.p. portable	65,000
5	24	8	6 "	65,000
6	24	8	6 "	40,000
7	40	8 (American)	8 "	80,000
8	36	10	8 "	90,000
9	48	8 (American)	8 "	100,000
To be worked on arrival of pumps.				
10	40	10 (American)	8 h.p. portable	Probable Yield. 90,000
11	36	10 (Robinson)	8 "	90,000

No. 1 is to be converted into forty pipes, with an 8-horse power engine and 10-inch centrifugal pump, when it will yield 90,000 gallons. In connection with these pumping stations, there are some four miles of flumes such as are described in the article on irrigation in the Burdekin Delta. The flumes and ditches have a fall of 1 inch per chain, and every three weeks they are running until 6 inches of water have been run over all the irrigated portion of the cultivation. Each pumping station is capable of supplying, on an average, sufficient water to irrigate 200 acres. On No. 5 station there is a wide drain at the lower portion of the canefields, which, owing to the porosity of the soil, carried away so much irrigation water by percolation that it was proposed to instal a pumping plant to send it back again to the head canal, by which means the same water might be used over and over again, but the cracks in the subsoil filled up and the trouble was over; so no pump was needed.

All the land is well manured and subsoiled to a depth of 2 feet. We saw one field of first ratoons, which started growing in the middle of January,

and on 10th May there was a fair crop, which promises at least 30 tons per acre. Under the old conditions—i.e., dependence on rainfall—this cane would have had to be ploughed out, not having time to make cane fit for the mill before the winter. The opposite field of first ratoons was cut last year for a return of only 10 tons of cane per acre. This was eighteen months old cane. Now 30 tons per acre is a safe estimate. At No. 8 station there is a magnificent show of cane, which is estimated to yield 60 tons per acre. There is about one mile of fluming here. If all the pumping stations were working simultaneously, they would throw from 16,000,000 to 17,000,000 gallons of water over 2,000 acres in twenty-four hours.

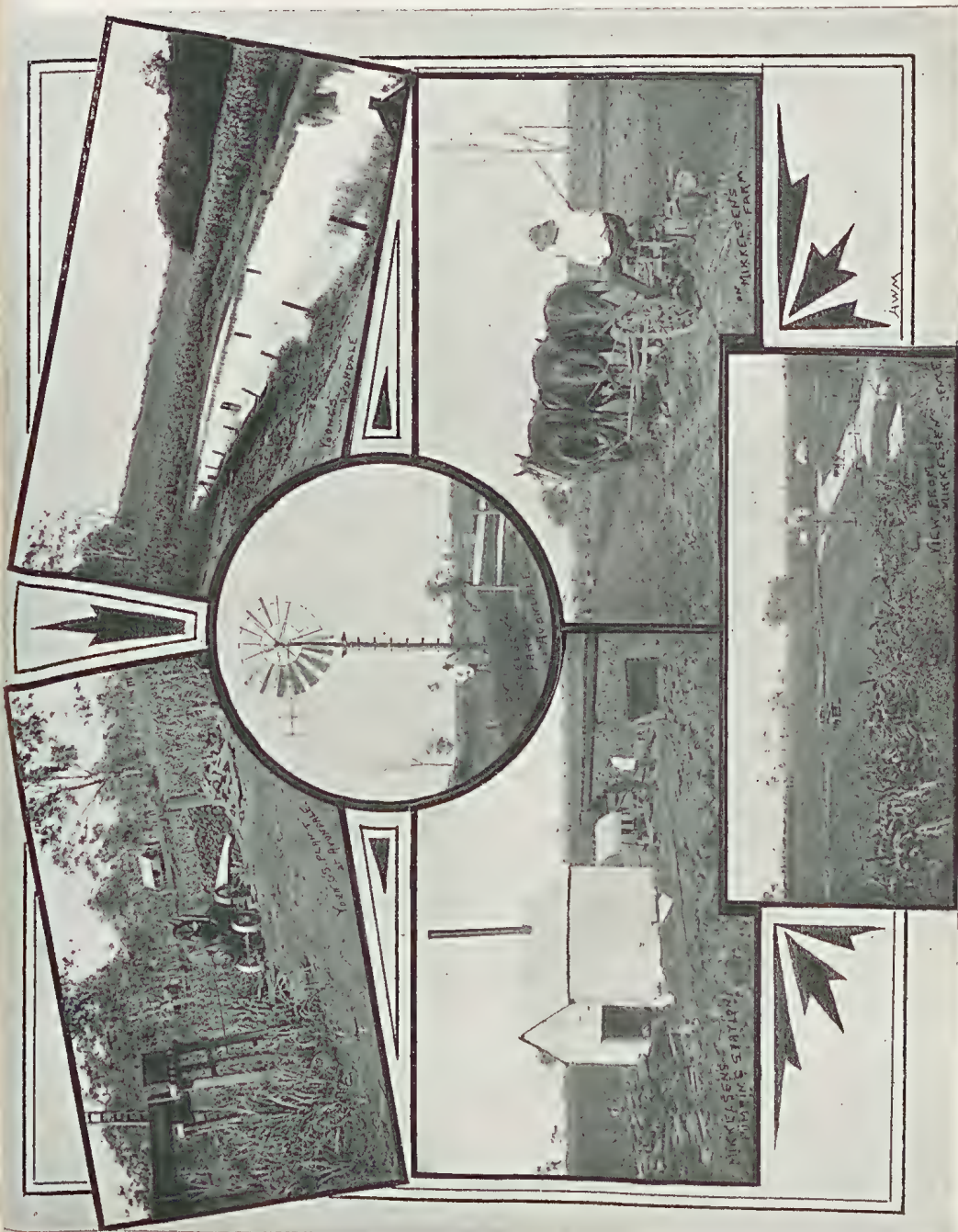
Under Mr. Young's guidance I drove over a large portion of the plantation, and the sight as one drove along avenues of cane quite 12 feet high, with already 8 feet of crushing cane, was most cheering. The illustrations will show this to perfection.

The plantation is a small township in itself. Besides the mill, there are all kinds of workshops, such as blacksmiths, wheelwrights, carpenters, and fitting shops. In the latter, all rough imported castings are turned down, engines repaired and fitted, spear-heads made—in fact, everything but heavy foundry-work is done on the premises. The employees number during the sugar season nearly 500, of all professions and trades. The kanaka boys no longer live in their grass huts, as they usually prefer to do. Instead of this, a row of substantial weatherboard huts have been built for them on a hillside, about $1\frac{1}{2}$ miles from the main buildings. As it happened to be Saturday when I paid my visit, I had an opportunity of seeing the "boys" returning from the fields. Several large trucks drawn by horses were loaded with jolly-looking boys, and preceding them were two or three trucks packed high with "ki-ki," consisting of stacks of bread and other provisions. If looks go for anything, the kanakas are certainly not stinted in the matter of provisions. Medical attendance and hospital accommodation are provided for any cases of sickness. The method of running the trollies by horse-power is one which I have not seen elsewhere. Usually the horses run in front, attached to a chain and swingle bars. The disadvantage of this plan is that, should the horses not be kept up to their work, or should the brakes fail to act, the truck runs down upon them—a circumstance which before now has caused broken limbs and consequent loss of the horse. Here, the animals run alongside the trucks, one on either side, so that there is no possible danger, and even young horses, which have scarcely ever been in harness, cannot help doing their work when harnessed in this fashion. Having spent most of the day at Fairymead, I came away impressed with the belief, or, perhaps I should say, the certainty, that no drought will again affect the returns on this splendidly managed property. Messrs. Young Bros. have also a plantation at

AVONDALE,

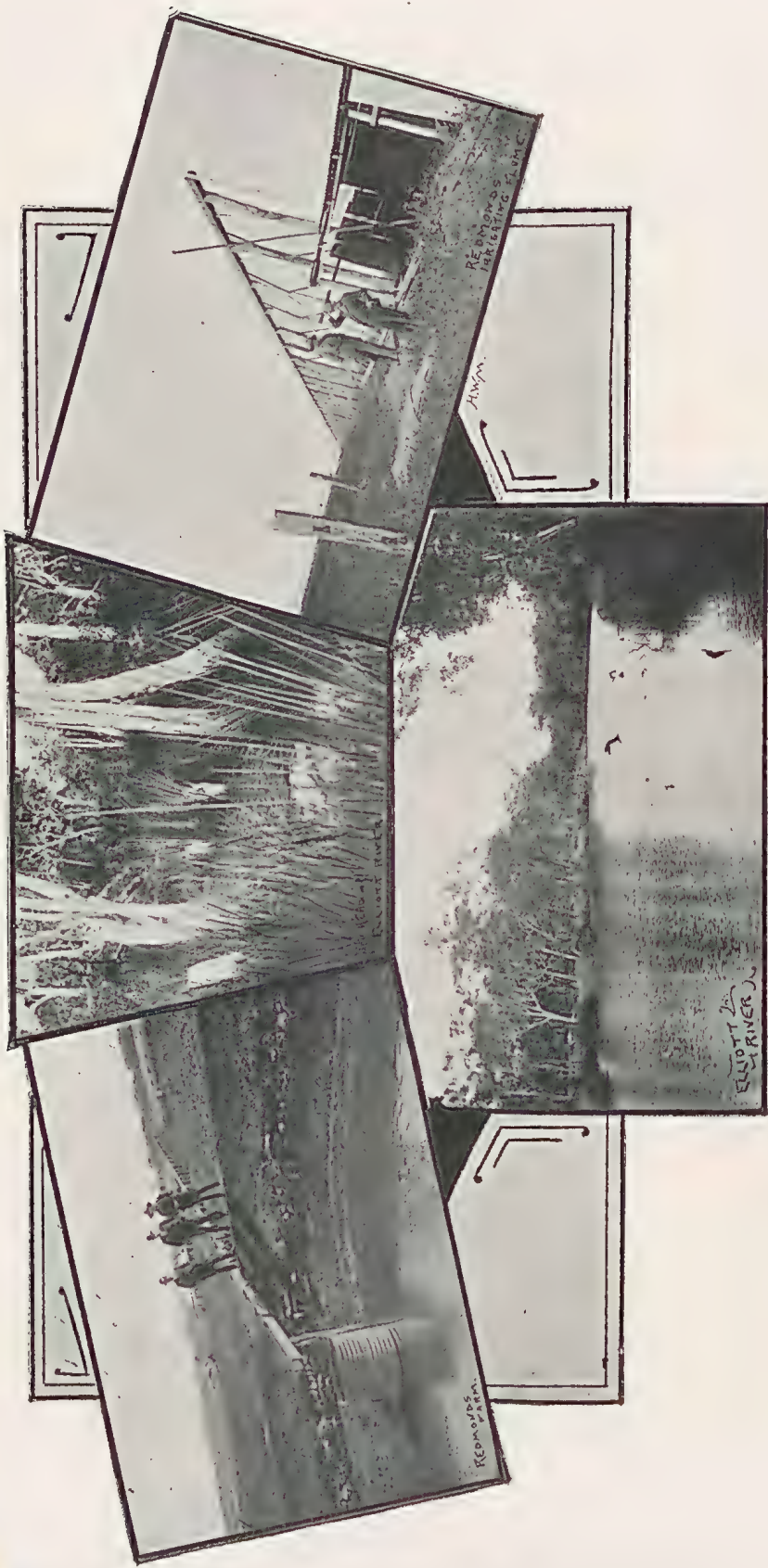
on the Gladstone line, fifteen miles from Bundaberg. This I also visited on my way to Fairview, a farm belonging to Mr. N. J. Mikkelsen, who is not only a successful farmer, but a mechanic of a most inventive and ingenious turn of mind. Many inventions will only work as models, and when put to practical work turn out to be mere delusions, but those of Mr. Mikkelsen are all turned to practical use. With an engine and pump, made by the Maurice Machine and Engineering Company of New York, he irrigates sixty-four acres, but could, with a little extension, easily irrigate 250 acres. The system employed is the tube-well installation, so universal when a subterranean supply of water at shallow depths is obtainable. Here I had a notable proof of the enormous advantage of irrigation over dependence on cloud water. Every acre of cane is being ploughed out, to be replanted and irrigated. Had an irrigation plant been installed two years, or even one year ago, Mr. Mikkelsen would have made large profits, as he has splendid land, quite level, and so perfectly adapted for irrigation. There should be, putting aside the possibility of fire, insect pests, &c., a magnificent crop of cane here next year, and, as the property is situated

Plate XXXVI.



IRRIGATION AT AVONDALE, BUNDABERG—MR. MIKKELSEN'S FARM.

Plate XXXVII.



REDMOND'S FARM AND ELLIOT RIVER, BUNDABERG.

close to the Kolan River, he will have a very short distance to cart his cane to the punts. It may be mentioned here that it was owing to Mr. Mikkelsen having read the report written by Mr. Aitken, one of the three delegates who visited the Burdekin Delta on Dr. Maxwell's invitation, on irrigation in that part of the North, that he determined to go in for the tube-well system, which promises to assure certain and heavy returns from the cane crops.

The pump lifts 1,050 gallons per minute with a twenty-foot lift. This almost equals what is being done at Fairymead, where, as I have stated, the yield is from 50,000 to 60,000 and 100,000 gallons per hour. Mr. Mikkelsen proposes to put in some wheat, for which the soil seems well adapted. I quite agree with an opinion I heard expressed as I returned to Bundaberg—that a hard-working, persevering, and intelligent farmer like Mr. Mikkelsen should be the proprietor of a farm five times as large as the one he owns.

Having travelled all over the cultivation, I went to see a steam launch which he had built and engined. Unfortunately the boat was in dock, and the tide was very low, so we could not take her out, but she seemed a very good, roomy boat, with fine lines, and, judging by the speed with which the screw revolved when the little oil engine was started, she should easily run eight miles an hour. I next examined an electric motor, a phonograph, and some other ingenious mechanical appliances, all constructed by my ingenious friend. Some massive, strong drays he had made were models of the wheelwright's skill. Being a blacksmith by trade, he naturally makes all his own ironwork. Finally, he pointed out to me a cheap way of rigging up a windmill. Instead of the usual tower-like framework, the mill was fixed on top of a single bush post, well stayed, where it worked the pump as well as any more elaborate and expensive contrivance. Having now done a considerable amount of walking, I was quite ready for the excellent dinner I was hospitably invited to share. After dinner, a too-short hour was devoted to music, Mr. Mikkelsen, who is an excellent performer on the violin, accompanying his daughters, who are born musicians, on the piano. A very instructive and pleasant day was brought to a close by the inexorable railway time-table. Our host drove Mr. Mobsby and myself to the train, and I wished him all the success in his farming operations which his pluck and energy richly entitle him to.

On the following day I drove out to the farm owned by one of the ex-students of the Queensland Agricultural College and his brothers. I did not hear this farm called anything but

REDMOND'S FARM.

Here there are 68 acres under lucerne and maize. The crops are all irrigated, and the water is carried to the highest part of the farm by a flume starting from the engine-shed, at a height of 17 feet. This flume is entirely of wood, instead of the zinc used on other plantations, but it is well constructed, and there is little or no leakage. The structure is 750 feet long, and the water pours into a circular dam of 85,000 cubic yards capacity. From this dam, the water is sent all over the lucerne fields in pipes, and distributed by canvas hoses. The plant consists of a $6\frac{1}{2}$ -horse power (effective) oil engine and pump. The water is obtained from a well 50 feet deep, but is only lifted 38 feet. The pump is driven by a belt from the fly-wheel. During the drought the Messrs. Redmond got handsome returns from their irrigated crops—so handsome, indeed, that the whole property is paid for, and they are possessed, in cash and property, of more than double the capital they commenced with. As nut grass is seen on all the plantations on the river, so both nut grass and Johnston grass flourish on this farm. The Johnston grass is taking almost entire possession of one lucerne field, but Mr. Redmond did not appear to think it a danger. He said that it was easy to get rid of by mowing it down before it seeds, when the roots gradually rot out. This may be, but if I were lucerne farming I should do my level best to get rid of such a persistent rooter as Johnston grass. Several acres are to be put under vines next season. Mr. Redmond told me something new concerning lucerne land. I have always been under the impression, and have practically proved my contention, that an

old lucerne field will produce splendid crops of other kinds when it is ploughed out. Here I was shown two fields of corn alongside each other. One field had been ploughed three weeks before the other, and had the benefit of some showers. The corn stalks were very tall, but it could be easily seen that the crop would scarcely be worth the trouble of harvesting. The stalks on the other field were far higher, and all were bearing very fine cobs. The reason for this, I was told, was that the bad crop was growing on an old lucerne field.

THE WOONGARRA DISTRICT AND THE ELLIOT RIVER IRRIGATION SCHEME.

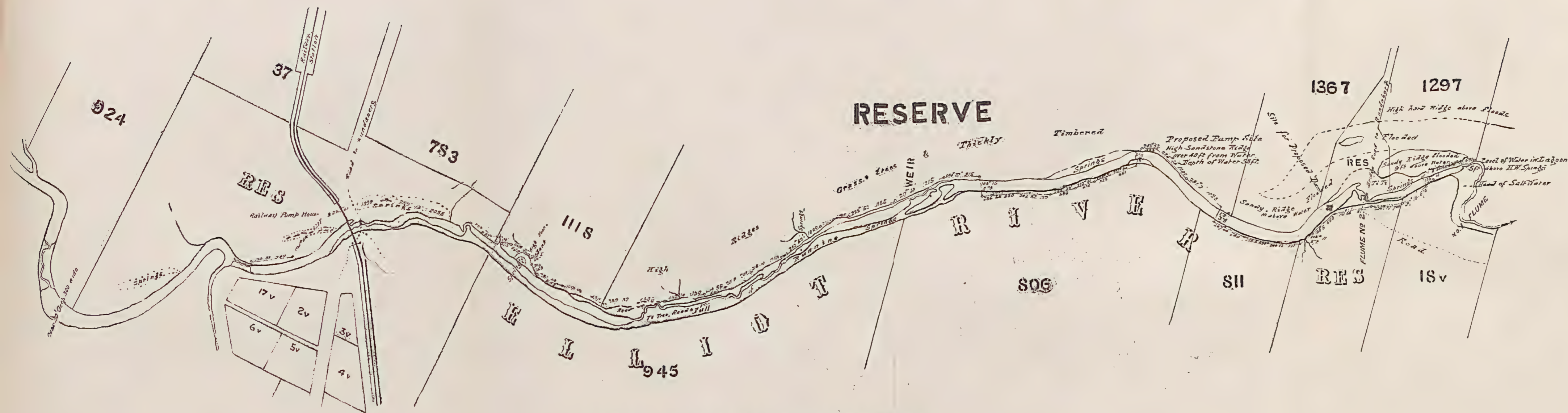
I have already mentioned that Dr. Maxwell has expressed the opinion that, as plenty of subterranean water has been found at Qunaba and other places in the Woongarra district, there is every reason to believe, with almost certainty, that it can be raised there from the underground either by shafts, by shafts combined with bores, or by gang-wells; and as his experience in irrigation and in obtaining water for that purpose is very great, his opinion on such matters is entitled to great deference. Still, it is human nature that all men are not in accord on any one subject in this world, more especially on scientific subjects—even doctors are said to differ with each other at times. Thus it comes about that another scheme was brought under my notice. My readers must clearly understand that I do not discuss the merits of either scheme. I am not an expert, but I merely record what I have seen and what I have been told; therefore I am incompetent to give any opinion on the subject.

Now for

THE ELLIOT RIVER SCHEME.

To form some idea of what is proposed to be done in the way of irrigating the cane fields and farms of this fertile tract of country, the reader must imagine a level area of some 6,000 acres extending from within four miles of Bundaberg to the ocean, some six miles further. The only high hill about the district is called the Hummock, a basaltic hill about 200 feet high, which gives its name to the plantation on which it is situated. There is a river in the district named the Elliot, which takes its rise in the country between Bundaberg and Maryborough, and flows into the ocean near the Springfield town reserve. I was driven out to inspect it by Mr. White, M.L.A. for the Musgrave. The portion of country where we struck the river is sandy, and intersected by gullies and billabongs, mostly full of running water. The river itself is something like the upper reaches of the Barron River above the falls, only here sand takes the place of rock. There are long, deep reaches 200 feet wide, the depth varying from 17 to 38 feet, according to accurate soundings which were taken during a period of six weeks. Some reaches are about $2\frac{1}{2}$ chains wide. Then comes a "narrow," where the clear, cool water rushes past with great velocity, and the sandy bottom can be plainly seen at a depth of from 6 to 8 feet. Below each narrow is another extensive reach. It has been estimated that 7,000,000 gallons pass down the stream each twenty-four hours. I am not aware how the flow was estimated, but presume it was based on the principle of measuring the flow by the shallowest spots. Where a river is divided into deep reaches by shallow narrows, the flow of water passing down the stream is gauged by the flow along the narrows. A reach may be 30 feet deep, but if the outlet is only 4 feet deep, then only 4 feet of water are in motion, and the remaining 26 feet are stationary. But this has doubtless been taken into consideration in determining the daily flow of the Elliot. I merely mention it, as it might be asked how 12,000,000 gallons daily can be supplied from a river down which only 7,000,000 gallons a day pass. The stationary water comes into the bill by the use of pumps. The highest point of the land to be irrigated lies at an elevation of 117 feet above the water—this during the drought.* The scheme favoured by the residents, or, as I understand, many of them (for some object to a possible water rate), is to carry the water of the Elliot by pipes 32 inches in diameter for a distance of six miles to a reservoir on the top of the Hummock,

* When rain fell two months ago and the Burnett River ran strongly, there was, according to an authority who visited the Elliot at the time, no response in the latter river.



THE ELLIOT RIVER.

THE UNITED STATES

a height of 218 feet. Thence it is proposed to irrigate, at the commencement, an area of 3,000 acres only, although there are 6,000 acres within the irrigable area. The pumping plant which would be installed would send 12,000,000 gallons daily over 3,000 acres. The financial aspect of the scheme indicates that a sum of £70,000 would be required to carry it out. Supposing this £70,000 to have been obtained, either by loan or by the issue of debentures, then interest and redemption have to be provided for. This it is estimated could be done by the imposition of an Irrigation Water Rate of £3 per acre. The results would be expected to work out as follows:—On the debtor side the farmer would have to expend—

On cultivating and harvesting, per acre	...	£12	0	0
Manuring	... ..	5	0	0
Water rate	... ..	3	0	0
		<hr/>		
		£20	0	0

On the credit side—

60 tons per acre, at 12s. per ton	... ..	£36	0	0
leaving a clear profit of £16 per acre.				

If we compare the cost per acre by this scheme with that by the well-system, it will be seen that there is very little difference between them, as by the latter a farmer possessed of the necessary capital or credit could lay down a plant sufficient to irrigate 200 acres for £760 as at Waterview; or to irrigate 250 acres as at the mill well at Qunaba, for £2,057; or, again, to irrigate 300 acres for £832, as at Davidson's well—the cost depending on the nature of the country through which the well is sunk, the height to which the water has to be lifted, the cost of fuel, and the distance of the pump from the highest point of land. If we take, for example, a shaft well, with pump, boiler, engine, piping, fuel, &c., &c., costing £2,057, to irrigate 250 acres: This works out to £8 4s. 6d. per acre. Add cultivating, harvesting, and manures, it amounts to £25 4s. 6d. per acre. With the less costly plants the expenses come to £19 15s. 6d., as at Davidson's well. There being then little to choose, so far as cost per acre is concerned by both plans, the next thing to be considered is the quality of the water. Here it will be interesting to learn what has been already done in the way of obtaining water in sufficient quantity and of good enough quality for irrigation purposes in the Woongarra. This cannot be better shown than by the following table, showing the work done in that direction. I omit the names of the owners of the land on which the wells were sunk, distinguishing them only by numbers:—

DATA OF SEVERAL WELLS IN WOONGARRA.

Owner.	Depth.	Quantity of Water.	Quality of Water.	Details of Formation passed through.	Remarks.
	Feet.				
1	18 ...	Insignificant ...	Soakage ...	Red and light-red volcanic soil	Soakage only
2	103 ...	Insignificant ...	Brackish ...	14 feet soil, 89 feet hard basalt, 10 feet rock	Owner now deepening same: cost of sinking, 30s. per foot
3	13·7 shaft 13·5 bore	Estimated 50,000 gallons per hour	70 grains salt per gallon	130 odd feet rock, bore through 36 feet clay.	Cost, 30s. per foot
4	94 shaft 91 bore	Estimated 5,000 gallons per hour	Brackish ...	94 feet mostly rock, 81 feet bore through sandstone, sand, and thin bands of clay	Cost, 30s. per foot
5	101 shaft 101 bore	Estimated 500 gallons per hour	Brackish ...	10 feet soil, 91 feet hard basalt rock-bore	Cost, 30s. per foot
6	101 shaft 100 bore	Estimated 1,000 gallons per hour	Good ...	Similar to No. 5 ...	Cost, 30s. per foot
7	100 shaft 100 bore	...	140 grains salt per gallon	...	Cost between 25s. and 30s. per foot
8	120 shaft 75 bore	Estimated 5,000 gallons per hour	228 grains salt per gallon	...	Cost between 25s. and 30s. per foot
9	40 shaft 30 bore	Not tested ...	Good ...	...	Cost between 25s. and 30s. per foot. This well is situated on coastal forest land, about 1½ miles from the beach
10	75 ...	Nil ...	...	5 feet soil, 70 feet rock, then sand	Cost about 32s. 6d. per foot
11	90 ...	300 gallons per day	Bad ...	20 feet soil, 50 feet rock, 20 feet sand	Cost, 35s. per foot

DATA OF SEVERAL WELLS IN WOONGARRA—*continued.*

Owner.	Depth.	Quantity of Water.	Quality of Water.	Details of Formation passed through.	Remarks.
	Feet.				
12	122 ...	4,500 gallons per hour	Good ...	20 feet soil, 48 feet rock, 34 feet yellow clay, 12 feet sand, 2½ feet rock, 4 feet clay, 4 feet rock, 25½ feet clay	
13	80 ...	350 gallons per day	Very bad ...	60 feet soil and sand, 20 feet rock	Cost, 25s. per foot
14	95 ...	400 gallons per day	Very bad ...	15 feet soil and sand, 50 feet rock	Cost, 25s. per foot
15	75 ...	400 gallons per day	Fair ...	5 feet soil, 70 feet hard rock	Cost, 35s. per foot
16	122 ...	...	Useless ...	20 feet soil, 72 feet rock, 30 feet bore through clay	Cost, 25s. per foot
17	80 ...	600 gallons per day	Bad ...	20 feet soil, 60 feet rock ...	Cost not known; estimated at 30s. per foot
18	150 ...	Nil ...	...	20 feet soil, 60 feet rock, 70 feet clay and sand	Cost not known; estimated at 35s. per foot
19	125 ...	250 gallons per day	Bad ...	18 feet soil, 107 feet rock (still in rock)	Cost, 57s. 6d. per foot
20	97 ...	100 gallons per day	Good ...	12 feet soil, 85 feet rock (still in rock)	Cost, 40s. per foot
21	92 ...	Dry ...	...	12 feet soil, 80 feet rock (still in rock)	Cost, 35s. per foot
22	124 shaft 70 bore	1,000 gallons per hour	Bad ...	14 feet soil, 110 feet rock ...	Cost, 4½s. per foot
23	122 ...	500 gallons per hour	Bad ...	14 feet soil, 108 feet rock ...	Cost, 50s. per foot
24	87 ...	200 gallons per day	Fair ...	16 feet soil, 71 feet rock ...	Cost, 35s. per foot
25	93 ...	500 gallons per day	Good ...	13 feet soil, 6 feet rock, boulders, and solid rock	Cost, about 25s. per foot
26	61 ...	300 gallons per day	Good ...	7 feet soil, 28 feet rotten rock, 29 feet solid rock	Cost, about 32s. 6d. per foot
27	97 ...	150 gallons per day	Bad ...	8 feet soil, 89 feet solid rock	Cost, about 25s. per foot
28	116 ...	1,500 gallons per hour	Good ...	12 feet soil, 74 feet solid rock, 30 feet bore	Cost, 40s. per foot
29	88 ...	200 gallons per day	Bad ...	18 feet soil, 70 feet solid rock (still in rock)	Cost, 37s. 6d. per foot
30	124 ...	300 gallons per day	Bad ...	18 feet soil, 106 feet solid rock	Cost, 42s. per foot

The above table will serve to show what energy, pluck, and perseverance have been and are being displayed by the Woongarra farmers in their search for the precious water so indispensable to their welfare, and, indeed, to their very existence on the land. Here we have an expenditure, up to the beginning of May, of £5,163, in what is practically prospecting. That good water and in fair quantity exists underground is shown by the yields of wells Nos. 12 and 28. The cost of No. 12 is not given, but presumably it would not be less than from 30s. to 35s. per foot, whilst No. 28 cost 40s. per foot. Presuming that these thirty wells had struck good water and that each well was made to irrigate 50 acres, this would amount to one-half the area which it is intended to irrigate from the Elliot River. Dividing the cost above given of prospecting already done amongst thirty farmers, it will be seen that on an average the cost has amounted to £3 8s. 10d. per acre merely to find the water. Having found it in sufficient quantity and of good quality, the cost of engine and boiler, pump, piping, fluming, &c., would have to be added to the expense always incurred. Now, should it come about that the Elliot River scheme fructified, then a water rate of £3 per acre would be most moderate, as the farmers would not then be obliged to set up each a separate plant, costing between £300 and £500. On the other hand, seeing that good underground water has been found in several parts of the Woongarra, it follows that there must be a continuous supply of subterranean water in the district, and this is a question in which the advice and assistance of Dr. Maxwell would be of the utmost service to the farmers. We may here state that at the Sandhills, twelve miles from Bundaberg, there is a shallow well in the sand, not far above high-water mark, from which a continuous supply of excellent drinking water has been obtained throughout the drought, not only for domestic use, but also for that of all the stock in the neighbourhood. The Sandhills form the eastern limit of the Woongarra district. It would be interesting to follow up the course of this water inland by a series of trial bores. This might lead to important discoveries in the Woongarra. However this may be, and whatever scheme may be adopted, we can only wish the Woongarra farmers the success which their perseverance entitles them to.

Plate XXXIX.



PORTION OF THE WOONGARRA PROPOSED TO BE IRRIGATED.

To understand the difficulties which they have to encounter in the matter of reaching the underground water, it should be noted that the Burnett Delta was originally on the same level as Fairymead. But in prehistoric times the overflow of lava from the Hummock covered up the level land, and consequently 100 feet or more have to be passed through before reaching the sweet water at the same level as at Fairymead.

The Woongarra is the first district to be constituted an irrigation area. At a meeting, held in May last, of farmers interested in the Woongarra irrigation, Mr. John White, M.L.A., in the chair, the latter is thus reported by the *Bundaberg Mail*:—

By an Order in Council the farmers there have the sole control of that fine river, the Elliot, from its source to the limit of tidal influence. He congratulated them on these facts. There was no doubt as to the valuation of irrigation. They had been told by Dr. Maxwell that they had the best sugar lands in the State of Queensland, and they now had control, he believed, of one of the best water supplies also, and he sincerely trusted they would make use of it at an early date. For himself, he could assure them that he would not spend a solitary penny in testing the quantity of the water available at the Elliott; he was satisfied there was enough and to spare for all their requirements. They might possibly not be able to deluge their land with water, but that there would be sufficient to enable them to get a most gratifying return for their outlay he felt absolutely confident. The cost of the installation would be about £70,000. The committee had all the necessary information to place before an expert if such were necessary. The chairman also said the question which would have to be decided at an early date was the best means of raising the money necessary to carry out the scheme. Personally, he saw no reason why the Shire Council interested, and even the Municipal Council, should not guarantee the interest on an issue of debentures. Anyhow, it was a subject they would have to give immediate attention to. Of course a private company could be formed, but they must remember that in that case they would have to hand over to that company the magnificent stretch of water in the Elliot—a most valuable asset—and he sincerely hoped they would never do anything of the kind, but rather that they would always control it, and, better still, use it.

What I have here written concerning irrigation in the Bundaberg district obviously does not include a description of every portion thereof. It would demand a lengthened stay in the district to enable me to furnish reliable data on all the irrigated and irrigable areas on the Delta of the Burnett and on other rivers of that portion of Queensland. There would even then remain the danger of the visitor, unless he were a scientific man whose sole business in life is to study the many problems presented by the large subject of water-finding and water conserving, its analysis, its distribution, and the thousand and one matters connected with the most vital of all questions to the rural community and through them to the interests of commerce—even then, I say, there would remain the danger of his being led astray in various ways, not the least factor of which would possibly be the great hospitality and assistance he invariably meets with at the hands of all with whom he comes in contact. It will then be readily understood that I present these notes on the Bundaberg district, and, indeed, all that I have written on other districts of the State on the same subject, from Cairns to Brisbane, with the utmost diffidence, but with the consciousness that nothing has been written in any spirit of partisanship nor with a view to advocating any one irrigation scheme above another. The great fact it has been my aim to publish far and wide is that Queensland possesses tens of thousands of acres of the most fertile land in the world, and that underlying those fertile lands there are vast stores of water sufficient to fertilise the lands of millions of people. Further than this, this State, extending as she does from the tropical to the temperate zone, presents facilities for the production of every vegetable product under the sun. All that is required in some of our fertile districts is an adequate water supply. That we possess almost everywhere. In the far North it is supplied by splendid rivers and streams which “go on for ever,” irrespective of droughts. In the Central, Western, and Southern districts there are in some

localities large supplies of surface water and a fair rainfall, but beneath our feet at shallow depths on the coast, at lower depths inland, there is, as I have said, sufficient water to make Queensland the most wealthy of the States of the Commonwealth even if the cloud water fell only once in three months.

SOIL, CULTIVATION, AND IRRIGATION.

LECTURE DELIVERED AT TOOWOOMBA.

By DR. W. MAXWELL.

(Reprinted from the *Darling Downs Gazette*.)

I daresay you are aware that the branch of agriculture in which I am at present more specially engaged is that of sugar production, and that in joining with you to-day in the consideration of what are more general agricultural affairs, I am moving somewhat outside of my regular course. However, I think we shall all agree in this—that, while it is necessary, as a rule, to concentrate our thoughts and actions upon a given line of work if we wish to reach results, on the other hand it is very helpful to occasionally get outside of our special domain, and to come in touch with those who are following other lines of activity, and who are engaged in other fields of primary production. We have this one great thing in common—we are dealing with problems all of which have their root in the soil. Moreover, in speaking of the principles which underlie the highest development of any specific branch of agriculture we are dealing with the basis of all agriculture; so that, as a study of soils and of water in their relation to crops is a particular part of my own especial work, it appears almost certain that a consideration of these matters cannot be without some advantage to you who are pursuing other branches of agriculture. This, gentlemen, is the reason I offer for accepting the invitation to be with you to-day.

THE SOIL.

The subject of agriculture embraces questions not only of production but also of transport and of markets. Production, however, is the first, and the basis of all other questions, and for this reason we shall at this time address ourselves to the matter of soils, cultivation, and irrigation, and to the relations of these to each other and to production. We have already said that we are dealing with matters all of which have their root in the soil. This is in the most fundamental sense the case. It is true that crops look to the air for a great portion of their food-matter; their power, however, to gather from the atmosphere depends so largely upon their root relations with the soil, and upon the available supply of the soil elements, that the matter can be summed up by saying that actually, as well as to all appearance, the soil is the ground condition of crop production. If that is the fact, then it is the most highly important of all the facts that we have in hand, and we cannot know too much about it. Crops, just as plainly as animals, depend for their sustenance and growth upon food, part of which we have said is gathered from the air, and the rest from the soil. This food is made up of certain and well known elements, and quite a majority of these are found in the land. This being the case, it becomes further clear that we should know which of these elements are the most vital and important; also the total proportions of the more vital elements that exist in different soils; and again, the state of readiness of these elements to be taken up and used by different crops for their growth. To come at these facts you will see that it is in the first place necessary to examine different kinds of crops to learn upon what elements of the soil they have more largely drawn, and which they appear to have decided are the most vital to their existence. On the other hand, we have to examine the soils and find out the proportions of these elements which are vital to crop growth that they contain. These several examinations are known generally under the name of chemical analysis. You probably know that the different laboratories of the Department of Agriculture are at this time very busily engaged in the study of soils, and of the fitness of different soils for different crops; and also in the analysis

of plants and feed stuffs in order to determine which are the best for milk, flesh, and fat-forming purposes, and when and how they can be fed to secure the farmer against loss that can arise from the presence of poisonous bodies in given feed stuffs during certain periods of their growth.

So far the soil work has been concentrated chiefly upon purposes connected with sugar production; but I may tell you that the Department of Agriculture has organised and is already pursuing a plan of work which, if it should reach maturity, will put in the hands of agriculture a statement showing first the composition of all Queensland soils and their respective suitabilities for different crops, so far as this can be determined by chemical analysis, and also the food values of all classes of feed stuffs, the results from which, I am sure you will see, must bear the greatest money value both from the field and the market standpoints. The work of the laboratory, so far, in dealing with the soils of Queensland has placed some very striking facts and extremes before us. In the matter of lime—a most vital constituent of soil—the amounts found in an acre of land, to a depth of one foot, vary all the way from 60 lb. to 40,000 lb. per acre. Similar, though less extreme results have also been found relating to the amounts of potash, phosphoric acid, and nitrogen contained in our different soils. These examples alone must emphasise to us the need of knowing what the soils contain if we wish to successfully grow crops in them. The soil, gentlemen, may be most correctly regarded as the bank—the Soil Bank—upon which crops draw to carry on their work and to maintain and mature their growth. The total amounts of the vital elements in the soil are the sum of the deposit, while the available proportions are the cash, ready for the instant needs of the crop. We may now proceed to show that cultivation is the management by which the deposit is maintained and kept in currency.

CULTIVATION.

If we wish to get down to the very foundation of the meaning and of the work of cultivation, we must begin at the beginning, and see how soils are derived by natural processes from rocks and stones. All soils have directly or indirectly been made from rocks. Rocks have fallen to pieces and crumbled down to earth because of the action of the air, which slowly or quickly eats into the most solid stones and turns them into the stuff of which soils are made. Cultivation is our part of the business of soil-making. We take up the work along with Nature, and merely facilitate the processes by which soil-making is finished. The object of cultivation—that is, ploughing, subsoiling, harrowing, and of draining, is, in the first place, to bring the soil more quickly and completely in contact with the air, so that its particles can be more thoroughly reduced and its component substances acted upon and put into a state of readiness to be taken up and used by crops. The keeping down and destruction of weeds is quite necessary; but that is a matter of very secondary importance compared to the business of getting the food actually into what may be called a digestible or soluble state, ready for the crop to at once make use of. In speaking of the amounts of the elements that the laboratory has found to be present in Queensland soils, we stated the pounds found per acre to “the depth of one foot.” When samples of soils are taken for analysis they are usually taken to the depth of one foot. At this place we may ask how deep do we plough, and move, and expose the soil to the air by cultivation? That must appear to us a most vital question if, as we have said, the first and great purpose of cultivation is to expose the greatest depth and mass of soil to the freest action of the air, so that the soil elements may be gotten ready as food for the crop. The laboratory says that, to the depth of a foot, there are so many pounds of lime, potash, phosphoric acid, and nitrogen to an acre. If we plough and cultivate only to the depth of 6 inches, however, we bring only one-half of these amounts of the said elements within the easy reach of the growing crop; and I think we shall all admit that the depth most often reached by the plough in our fields is even less than six solid inches; in fact, it is more often only 3 or 4 inches. Again, if the land is

ploughed only, or less than 6 inches deep, and is ploughed only once before planting, we have a trouble of two kinds. Not only is there a shallow depth of soil broken up and made ready for the crop to gather its food from, the failure to replough and cultivate and thus reduce the soil to a fine tilth and expose the elements to the air, has left those vital elements in a very unprepared state for the immediate needs of the crop.

Gentlemen, we simply cannot overestimate the first necessity and importance of deep ploughing, and a thorough exposure of the elements of the soil to the action of the air if we are to expect to grow paying crops. It is clear to all of us that the deeper we plough the more we increase the mass of soil from which the crop can gather its food. Some farmers say they cannot get the plough in any deeper than they are now doing. If that is so, then it is not very likely that the tenderest fibrous roots of the growing crop can force their way down deeper than the steel share can go. As for the effects of reploughing, and thoroughly exposing the soil to the action of the air, I can assure you that the results obtained by certain actual tests have shown that the available amounts of some of the elements that are strictly required for the instant needs of the crop can be doubled in a few months by such deep and thorough cultivation as we have described. Therefore, let us remember that the amounts of the vital elements of the soil and their state of readiness for the immediate use of the crop, form the first condition of soil fertility, and that cultivation is the agent which controls that condition, and consequently very largely the size of the crop that can be grown. So far, we have spoken only of the work which deep ploughing and thorough cultivation do in increasing the bulk of soil that plants can gather their food from, and in getting the soil elements ready for the immediate use of the growing crop. But this deep cultivation has another and a most important work to perform. Crops not only require the solid elements which they get from the soil, they also need water. Water is vitally necessary in itself to the life and existence of plants; it is also equally necessary in the soil to bring these elements into the state in which the crop can use them. Crops cannot swallow solid food. They can only take it in the dissolved form, the form in which it is found in the water which the crop draws up from the soil by its roots. Therefore, when the stock of moisture is practically exhausted in the soil to the depth that the roots of the crop are chiefly living in, their growth must stop. And the growth stops as we have explained, first, from the direct want of water, and second, from the need of food which cannot find its way into the roots of the crop because of the lack of moisture. In the light of these facts, we cannot help seeing how much deep cultivation must also mean to the crop, so far as its natural supply of moisture from the soil is concerned. We have said that deep ploughing, and in some cases, subsoiling, deepens and increases the bulk of soil from which the crop can gather its food. Just as truly it increases the depth and space from which it can draw its water. It is true that some moisture can rise up to the roots even where the roots cannot go down to the moisture. This upward movement of subsoil moisture is too slow, however, to meet the needs of the crop, and particularly when great heat waves are blowing over the land. As a result, the crop wilts, and in severe cases, is ruined in a few days. Moreover, when the subsoil moisture does rise to the upper 6 inches of surface soil, it is picked up by the sun and wind, and lost to the crop. There are two chief purposes to have in view in considering the natural water supply of the crop. First, the deep movement and tillage of the soil, in order to let the roots permeate and go down to a great depth, whence they can draw upon a larger supply of moisture, and where they are protected from the high temperature that can prevail in the upper soil during waves of intense heat and wind. Second, the keeping of the upper 3 or 4 inches of soil in a loose state by surface cultivation in order to prevent the escape of rising moisture. Doubtless, some of us have in mind examples which have illustrated beyond any question the operation of the principle of deep cultivation which has been explained. I could place before you the case of farmers, some of

whom have ploughed and tilled their soil fairly well, and others who have merely scratched the ground with the plough before planting, and afterwards left the crop to look after itself. Only a short time ago I inspected corn crops that were growing upon adjoining pieces of land. The soils were the same in appearance, and also in composition, for they had been analysed in the Bundaberg laboratories. They were planted at the same time and with similar seed. Yet, when I saw them, the crop had wilted under the continued drought, and was only about 3 feet high, and in flower, but without a prospect of maturing a cob. The other crop was quite double its height, and promised not less than 20 bushels of corn to the acre. What was the cause of this enormous difference in the weight and money-value of these crops? The land in one case had been ploughed and reploughed and worked to a depth of 9 to 10 inches, and the surface soil kept loose and clean by light cultivation. In the other case the land had been ploughed only once, and merely to a depth of 4 inches; and the weeds had been left to take full possession of the ground. These things, then, compel us to look upon deep and thorough cultivation as the means of bringing within the reach and use of the growing crop the first great source of water supply—viz., that which is contained or capable of being contained in the soil itself. In some localities, covering wide areas, this may be found to be the only source of possible water supply. In such cases everything depends upon its conservation and careful use. I, therefore, gentlemen, would ask you, in the first place, to fully realise and get into practice upon your farms this fundamental principle of all safe and successful agricultural operations—deep and thorough cultivation. As we have seen, it is not only the agency by which the largest mass of soil food is brought within reach of the growing crop; it also controls the first great source, and in many cases the only available source, of water supply that the crop has to draw upon for its life and growth.

IRRIGATION.

But, gentlemen, after all that has been said concerning the fundamental necessity of deep and thorough cultivation, and after everything possible has been done with the plough and cultivator in getting the land into shape for growing a crop, we may find that our best efforts are not enough, and that the whole thing results in a crop and money failure. This leads us to a final grasp of the hard facts, that there are locations where, due to climatic conditions, the natural water supply from the soil in average years is never enough for the production of crops in general, and that for certain special crops it is totally insufficient; and, further, that in severely arid and rainless seasons, and during a succession of such seasons, the natural moisture supply of the land is helpless to mature crops and to maintain plant and animal life in existence. The bitter experiences of the past two or three years have shown that not only our annual surface-feeding crops, but even deep-rooting trees and forests have wilted and dried up through the lack of soil moisture; while the roll-call to-day tells the tale of the grim and ruinous devastation that has fallen upon our herds and flocks. We thus see that there are locations where, and there are seasons when, the natural moisture supply of the soil, from rainfall, is utterly inadequate; and this truth forces us into a situation face to face with the question of other sources of water supply, and with the possibilities of irrigation. The question of irrigation resolves itself naturally under three chief heads:—

1. Sources of Supply.
2. Means of Recovery.
3. Methods of Distribution.

These make up the whole subject; but each division is a study in itself.

Dealing first with "Sources of Supply," we find that these can also be placed with convenience under three different heads, viz.:—Visible supplies, including running streams, or lakes supplied by such streams; second, underground supplies, embracing moving waters which are found at relatively shallow depths below the land surface, and which are found discharging into

the ocean at or near sea level: finally, artesian supplies, which mean those impounded waters that are contained often at great depths below the land contour, and also below the sea level, but which rise to the surface over the lower-lying lands within their sphere, due to pressure.

Now, the question of the first concern is—"Which, or how many of these sources of supply, and in what proportions are they available for use in Queensland?" It is, of course, very interesting reading to learn what is possible and what is being done in other countries; but the question at this moment is—"What is available and possible for us?" Gentlemen, it is pure business; the solution of the question, however, is the business of the individual of the community and of the State. Queensland is without great rivers that are being fed by constant rains or melting snows from high altitudes, and which are the basis of collective systems of irrigation upon a great scale. It happens that the rivers which maintain a constant flow of considerable volume are in the northern part of the State, where the rainfall is greater and more uniform, and where irrigation is not needed. Yet we are not wholly without visible stream supplies. Up to this time, and during a period of drought, coastal streams have yielded a few million gallons per day in the district of Mackay. The Burnett River has furnished water for the needs of 1,000 acres of cane upon the Bingera Plantation, although it is necessary to state that in dire drought the stream is liable to stop running. Then there are coastal creeks, a few of which, even after the longest period of drought, have still continued in small flow, although we have to admit that the greater number, in extreme drought conditions, have utterly dried up. Upon the Downs there are small streams which held out, notably during the recent years of extremely small rainfall. I visited the Condamine River, near Warwick, some few months ago, and found Mr. McDougall, of Lyndhurst, growing excellent lucerne with water from that stream. At this time I learn that the Condamine is in flow again. So that, gentlemen, although Queensland is not blessed with great and inexhaustible visible supplies, and although our rivers and streams are erratic, and are liable to fail at the period of acute need, we will not wholly ignore the visible supplies, even small and unreliable as they are. I call attention to these supplies to show that they have some value, and to induce men located upon the banks of such streams to make that value the greatest possible by insuring the utmost use of it. If a man chances to get low down in the purse he does not scorn or throw away the little that he has left. It is a first law in economics that the value of a material rises in the proportion that its supply fails, or that the demand for it increases. During the present drought there are examples to hand showing that very small supplies of water have reached a hundred-fold increase of value by enabling their owners to grow and sell produce at enormous prices, while the majority of producers were making nothing. It is a matter for each farmer or producer, or a locality of producers, to see what they can do in their own special conditions, and to do it; and in that way they are also doing for the community and the State. We now turn to the second source of supply, the "Underground waters which are moving towards and discharging at or near sea level." Several years ago Mr. John Drysdale, who is a professional engineer, and who has had great experience in India, noted the indications of a large moving supply under the broad areas of the Burdekin delta. These evidences were not confined to lagoons, which mark the older pathways of the river, but included the results of shallow shafting or boring from the land surface down to some 20 or 30 feet. The extension of the prospecting work in that district made clear the fact that the river itself represents but a very small proportion of the great volume of water that the Burdekin catchment is sending into the sea, and that by far the greater part of the discharge of that watershed is following invisible courses, which appear to have been the earlier pathways or beds of the present river. Previous to the present wet season opening in the North, the Burdekin River, by actual measurement, was furnishing only 360,000 gallons per day; yet the underground supply was ample to meet all the requirements for cane irrigation in

the district. In fact, the supply is necessarily far in excess of any draft that has been made upon it. At this time, the pumping power actually installed for making use of the underground supply of the Burdekin delta is equal to 9,500,000 gallons of water every 24 hours. Again, similar conditions are found to cover the Pioneer delta at Mackay. The river, previous to the present floods, was, and had been for many months, running very low. An actual measurement in January of this year, when I was last in Mackay, gave the visible supply at 2,250,000 gallons per 24 hours. This was an incredibly small volume for such an apparently large river. Let me tell you, however, that every gallon was being put to the most righteous use upon the cane crop. Examinations of the underground of the delta have brought and are still bringing to light the presence of a more or less voluminous supply of moving water that is finding its way to the sea, chiefly along old underlying courses of the present stream. This underground water is already being made use of, and, should dry seasons recur, its use will certainly be extended. Further, in the Bundaberg district and within the areas of the Burnett delta, distinctly similar conditions obtain. The underground water has been found, and during the past year has been brought extensively into use. At the end of this year some 1,000 acres will be under irrigation. We have mentioned three of the more important deltas upon the coast in order to show that large supplies of underground waters are present, and that these waters can be, and are now being, upon a still relatively limited scale, used in producing crops, instead of wasting totally into the sea, which was the case, and only a little while ago. But these are not the only localities and deltas where such underground water is present, and can be used. Wherever a river, or creek, or stream is found carrying off the surface or visible discharges of a watershed these visible watersheds are also, and necessarily without exception, the courses of underground waters which, at their head, and during their course of travel, have found access to the older beds of the streams, and are invisibly stealing out to the ocean. These underground courses and supplies can be greater or less according to the area of each catchment, and to the geological conditions which determine the mode of movement of each discharging stream. As we have already shown, the underground supply underlying the greater streams and deltas is very large. In other localities, where the catchment areas and the visible supplies or streams are small, then the underground supplies must certainly be relatively small. But, gentlemen, these smaller streams with their catchments are very numerous, and the sum of the supplies which their underground waters could possibly furnish to a hundred or more different farming localities, if rationally made use of, would form an aggregate of high financial value to those localities themselves, and to the State. We must not let out of sight for a moment the ground fact that it is the parts which make the whole, and that the cardinal value that is to accrue to the State must be made up of the smaller values which the intelligence and enterprise of scores of localities have brought to fruition. On the Burdekin delta, each pumping plant gives but a limited output; it is the combined labours of the 35 pumps which furnish the 99,500,000 gallons per day.

In coming finally to the matter of "Artesian Supplies," I propose to say very little. As a matter of fact, I have not yet been out in the districts of Queensland where the artesian bores are in operation. We are all aware of the vast advantage of their discovery, and we are also impressed by the prospect of the greater value that those deep, impounded supplies may possibly be made to serve.

Having noted briefly, gentlemen, the several sources of water supply which the conditions of Queensland appear to afford, we may now proceed to a few words upon the second part of the subject, the

MEANS OF RECOVERY.

It is clear, in the first place, that the mechanical means to be used to recover or obtain water for purposes of irrigation are largely governed by the

nature and sources of supply. Huge open rivers, or stream-fed lakes, and concentrated underground supplies, admit of pumping centres of the highest power and duty. In some other countries, where great rivers are in flow, and where these do not allow of diversion and direct distribution by gravity, pumps, of high million gallon duty per day, are in service furnishing water for large areas. Upon the Hawaiian Islands, where the sole water supply is the rainfall upon the mountains, and which has a very concentrated underground discharge to the sea, maximum duty pumps of the most modern type are in service. Over 20,000,000 gallons per day are being lifted by the power under one roof, and from shallow, connected shafts closely surrounding the pumping plant. The small island of Oahu, upon which Honolulu stands, and which covers only 600 square miles, has to-day a pumping power equal to more than 250,000,000 gallons per day. At the Bingera Plantation, the proprietors decided to make use of the Burnett River supply, and installed a pump with a duty of 10,000,000 gallons per day, the water to be distributed from one centre over 2,000 acres. As we have already said, the Burdekin delta cane areas are being irrigated by 35 different pumps, of different duties, each pump being a centre of distribution. The same condition obtains in the Mackay district, and also in the Burnett district south of Bundaberg, where the underground supplies are being obtained and distributed by numerous pumps chiefly of low duties. I am making use of these actual working examples to illustrate the principle already stated, that the means of getting the water are determined, in the first place, and largely by the nature of the supply. There is one factor which also to a large extent controls the selection of the pump for making use of the supply, and that is the size of the farm and its water requirements. Small tracts or farms in given districts are just as much in need of water as larger areas, but it is clear, for economic reasons, that the pumping plant and its cost must be fitted to the service it has to do, and this is precisely the point where we touch the case of the small farmer, and of limited areas; and these comprise, by far, the greater portion of the agricultural areas of Queensland.

In the relation of irrigation to the average sized farm, the first difficulty is, the farmer believes, that it is not suitable to his small conditions. First, he labours under the idea that irrigation is not possible on a small scale; and secondly, that it would not pay. Probably the majority of farmers are still honestly under the conviction that this is the case. The question that he should once more ask himself is, "Is this actually so?" Upon the Burdekin delta the cane farmers, only three years ago, said in relation to irrigation, "It is all right for the plantations, but it is not for us smaller men." Six months ago, when I was visiting the district, some of the same farmers said to me, "If we had only had sense to see this sooner we should have been a deal better off to-day." The persistent drought, added to Mr. Drysdale's advice, had forced those men to give irrigation a trial, and to-day the honest labours of several of them are being rewarded by well-earned results. Well, cane-growing is not the only kind of agriculture in which water, on a small scale, can be used, and irrigation of big areas is not the only scale that will pay. We have already pointed out that certain small producers, during the present drought, have made a hundred-fold more out of their land by producing, and selling produce at high prices, when the majority of producers had grown nothing.

To this it may be replied, "That is all right; but if everybody had done the same there would have been nothing in it." Let us see if this would really have been the case. Let us bear in mind that saving, as well as selling, is also making. And here let us consider what has happened to innumerable farmers, and in many localities throughout Southern Queensland. What have been the losses in cattle alone from the drought that has been upon us? I do not know precisely what has happened in your district, but some localities have reported to me that some individual farmers have lost every head they possessed; others have lost one-half, and general statistics are indicating that in given localities the totals have been reduced by as much as 30 to 50 per cent. And to be

added to these disasters are the losses which have almost put some individual families upon the plane of actual want. Now, irrigation, upon a very limited scale, and where only a relatively small volume of water had been available, would have been security against most of these cases of deprivation and loss. Water enough to have kept in growth an acre or two of lucerne or of sorghum, and a few patches of vegetables, would in many instances have sufficed to hold the families and their herds together. Examples are not wanting where this was actually done. So that we are justified in saying that local irrigation would not only have profited enormously the few fortunate ones who were able to use it; it would have saved the situation, on a broad scale, for many of those who not only lost their weekly returns of the dairy, but a large proportion of whose cattle are dead. Gentlemen, one of the first important things that we need to learn, and which it is hoped the drought has taught us, is the immeasurable value of even a small volume of water for crop use in such conditions of acute emergency as we have passed through. Usually irrigation is discussed with the view of increasing an existing crop. We, in the first instance, require to consider it from an urgent motive of self-preservation. Wherever water is visibly or possibly present, surely we should not require urging to develop and secure it for the first immediate purpose of keeping alive our stock, and such areas of crop as they require. This should be the first immediate aim in putting in the simplest forms of irrigation. Then we may reflect further upon the value of securing for ourselves seed corn, seed wheat, seed oats, and seed potatoes, for the requirements of the farm; and in many cases one-half acre of each of those cereals and tubers, brought to full-bearing maturity by irrigation, would be enough for that purpose. In applying irrigation to cane, the first step is to do enough to ensure good seed. Surely the present situation must impress these possibilities upon us, and cause us to strive after all that is within our reach. Moreover, gentlemen, the making of provision for keeping alive our herds and stock is not only the first thing to be done—in many cases it may be all that is found possible. But how much more urgent it becomes that this should be attempted if it is all that can possibly be done. All of us, I think, will agree that, in the first place, we must strive to keep our animals and herds alive. After that, we should secure for ourselves, if possible, healthy, mature seed for all crops that we intend to grow. When this is done, in some cases there may still be a balance of available water that can be applied to general crops. In other cases, and these may be very many, and may be found in many localities, no surplus of water may be left; then in all such instances we shall have to fall back upon, and make the utmost of, the natural soil moisture, and by means of the methods of deep and thorough cultivation that have already been described.

Summing up our observations, so far, upon "Sources of Water Supply" and upon the "Means of Recovery," and particularly in their relation to the conditions in this district, and more generally upon the Downs, it is indicated that supplies of water may be obtained, first, from local streams and their underground beds. Examples of this are found at and in the neighbourhood of Warwick and in other localities. Second, from impounded or moving underground supplies at a relatively shallow depth, of which not only is an excellent example, on a notable scale, furnished by your city as a result of the enterprise of its municipality, but in localities extending over a large area the sinking of wells is furnishing proof that local vagrant water in small or greater volume is almost everywhere to hand. This visit of inspection in some localities of your district has still further strengthened my persuasion that you have available water around you, and probably in amounts which would certainly largely save the situation in acute droughts such as we have passed through. Finally, it has to be determined what further aid may be possible from the deeper sources of artesian supply. Concerning the means of recovering the water from the several sources, the pumping plant in this city furnishes one, and a rather elaborate example. For low lifts of considerable volume, examples are found near Warwick, and elsewhere, showing what

centrifugal pumps and low-power engines will do. Coming nearer to the conditions of the smaller farmer, and to the utilisation of more limited water supplies, we fall back, first upon the oil engine, and finally the windmill is the motor powers within reach of, and adapted to conditions on the smallest scale. The true economic value of the windmill to the farmer in small conditions has hardly begun to be duly appreciated. The common impression is that a windmill is merely to furnish a few gallons of water to a score or two of cattle. To-day windmills, of different powers, are available that will lift from 200 gallons per hour to 1,000 gallons per hour, to a height of 100 feet; and these mills vary in cost from £15 to £50. I cannot too strongly urge the fuller realisation of the value and fitness of windmill pumps to the great body of men in the smaller conditions of agriculture.

So far, gentlemen, we have not even touched upon the third division of the subject of irrigation, that is,

METHODS OF DISTRIBUTION.

At this time we do not intend to give it more than an initial notice; for, as we said before, it is a distinct study in itself. Of course, it is well that we understand what we mean by the term "irrigation." If a man is found lying by a waterhole, and dying of thirst, do you think we should stop to analyse the water before offering it to him? Also, if your stock, and your vegetables, and your peach trees are at the last stage of existence for want of water, are you going to waste days of inquiry to determine just how much you are to give and by what method you are to supply it? Not at all. You let them have it at once, and as much as they will take. You are not feeding cattle, nor irrigating crops; you are keeping them alive by the first means to hand, and at any cost. Irrigation—the rational, scientific application of water to crops—is quite another thing, with another purpose, and governed by other and definite natural laws, and requiring a large preliminary array of data and knowledge. In initiating a system of irrigation in a country or district which is intended to go on year after year, and for an indefinite term of years, it is in the first place necessary to have in hand ample statements showing the physical and chemical constitution of the different soils, and the salt contents and quality of the waters, which are furnished by analysis. It is further necessary to know, by actual experimental demonstration in the laboratory, the powers of different soils to absorb and retain moisture.

If you refer to page 9 of the bulletin on "Irrigation on Hawaii," you will see that while some Hawaiian soils absorbed only 32 per cent. of their own weight of water others took up 87 per cent.; and that the latter permanently retained nearly as much moisture as the former were capable of taking up. These and other similar physical and chemical factors lie at the very foundation of a true knowledge and practice of irrigation. But, gentlemen, the Department of Agriculture is now alive to all these matters. I have already told you that the Bundaberg laboratories have made more than 2,000 soil analyses; and there are now approaching 1,000 soils that are waiting to have their water absorbent and retentive powers determined in relation to the matter of irrigation as soon as we can get to them. If the present plan of the Department should be extended to cover all the agricultural areas of Queensland, then I assure you that no other country, with which I am conversant, will be better prepared with such information that is necessary for guidance in agricultural work than this State.

The chief and initial purpose of this address has been, in the first place, to put before you the relations of the soil, of cultivation, and of moisture to each other, and of all these factors to crop production. Further, to indicate the possible sources of water supply for irrigation, as supplementary to the soil factors in crop production, and to note the possible mechanical means of securing obtainable water in the varied conditions of Queensland, and of this section of the State. If at a future time, and after water supplies upon a more general scale have been sought and obtained, you should care to hear something

upon the various methods of using it, I shall be very ready to be at your service.

In conclusion, gentlemen, I would urge you to take to yourselves and realise the necessity of the matters that have been dwelt upon. Bear in mind that the soil in the first instance is not only the source of essential plant food, but that it is also the location of the great primary water supply of growing crops, and that deep, thorough cultivation is the means by which both the food and the water are unlocked and made economically available for crop growth. Again, I also venture to urge you, each one of you, to look into your special local conditions, and I am quite persuaded that in many cases you will discover that the water supplies within your reach have a crop-producing power that you had not realised, and that it is possible, and will pay, to put it into use. Just think of the acutely pressing reasons which urge you to do this. There are the losses and calamities of the past of which we need not say more. Then look at the fine lands you possess, and dwell upon, which are capable of enormous production under fair treatment and good conditions. Not only are big crops possible, but large crops of the highest quality. I have told you that the laboratories, in addition to the soil work, are engaged in determining the relative feed values of our crops and feed stuffs, and at this place I may say that one of the first results obtained has shown us that Queensland or Australian maize has a notably higher feeding value than the maize of any other country I know. For your safety and in your own interests, and in the interest of your district, and of the State, I would urge you, gentlemen, to give these matters your closest consideration and care. If generous rains are falling once more, then remember what is possible, by means ready to your hand, in conserving the rainfall, so that the first great moisture supply contained in the soil may be secured for the use of future crops. But don't be blind to the recurring possibilities of the future; keep the plain history of facts before you, and realise that as drought has periodically come upon the State in the past, and at present, surely it will in the future; and see to it, when it does recur, that you are more amply prepared to meet it.

Dr. Maxwell, who spoke for upwards of an hour and a-half, resumed his seat amidst loud and long continued applause. His remarks during the evening were attentively listened to, and at times he was repeatedly applauded.

Mr. R. G. Wonderley asked Dr. Maxwell: What would be the cost of irrigating 10 acres of black soil? and what quantity of water would be used?

Dr. Maxwell, after lucidly explaining the different characteristics of black and red soils, stated that it would take—roughly speaking—about 30,000 gallons of water per week per acre. The cost would be determined by the kind of pump used in hoisting the water and the distance the water would have to be pumped. Every individual case had to be considered and discussed on its merits. If any of those present were thinking of going in for a pumping plant, he would be only too pleased to help them solve their difficulties, provided he was furnished with all necessary particulars. He stated that every analysis that left the Department of Agriculture had the full mark of reliability on it. He also pointed out that the feeding constituents of Queensland-grown maize were greater than that of any other maize produced in the world, and it was their duty to make this fact known so that their maize might command a higher value in the markets across the seas.

A vote of thanks to Dr. Maxwell for his very interesting lecture was moved by Mr. J. H. Munro, and seconded by Mr. F. J. Paterson.

Dr. Maxwell suitably replied, and a vote of thanks to the Mayor concluded the proceedings.

MALTING BARLEY.

An interesting article in the *Mark Lane Express* on choosing seed for malting barley concludes as follows:—

The conditions of the growth of barley are in some respects very similar to those of wheat, but in others they are very different. Thus, as a rule, wheat

is sown in the autumn, but barley not until the spring, so that barley has much less time for the distribution of its roots for securing the stores of nourishment within the soil. And it may surprise many to be told that were the cultivation of wheat from any cause to cease, it would, as a species of plant life, speedily die out and vanish from the earth as completely as the extinct forms of some earlier geological ages, but in the case of barley, that cereal would maintain its existence in a wild state. In the early history of malting barley it is believed that the variety sown was the six-rowed kind, but with the development of agriculture on more scientific lines, and a due regard to the fact that the soil and condition of the land most suitable for wheat-growing is generally not equally well adapted for the cultivation of malting barley, a preference was shown to a barley containing a greater quantity of starch. Thus the two-rowed barley was selected for growing for malting purposes, inasmuch as only the row attached to the central spiklet of the ear on either side is fertilised, and so have a much better chance of developing, as well as obtaining, by reason of the barrenness of the lateral rows, more sunlight. Now, as regards the selection of barley seed, we know that during the last hundred years much attention has been given to the manner of its cultivation, in view of the ever-changing results due to climatic and other conditions, but, with the development of the trade in foreign malting barleys, it has become more necessary still for our farmers to give increased care in the selection of their seed and seize every favourable opportunity to secure the best crop possible both as regards quality and yield. The barley-growers' aim in England is to produce grain suitable for malting purposes, and command a high price, as, when a heavy crop of inferior quality barley is produced, the price obtained on the market is comparatively low, and as the disparity between the range of prices obtainable for barleys, and the ranges of prices obtainable for other cereals is very great, barley that is unfit for malting purposes is, therefore, considered by the English farmer a failure as a crop. In this connection our farmers do not pay sufficient attention to the weight of their seed barley or the uniformity in size of the sample for cultivating purposes, and so the most important fact from a maltsters point of view is neglected—namely, that the barley has all ripened simultaneously—otherwise the germination in the malting will be irregular. It may be taken for granted that the heaviest barleys are the best for malting purposes, and as seed produces the most invigorating plants, and, further, the amount of protein bodies is lower in full, plump grains than in poor or stony samples, while the husk is relatively thinner. The chemical analysis below of ordinary barley is the average of the tests made by several chemists, and deduced from the best works on this subject, and therefore can be taken as a guide as to the different constituents of the grain. From comparison the farmer can judge the value of any seed barley submitted to him if he takes into account that his object in growing barley is to produce grain rich in starch, and therefore fit for malting purposes:—

Constituent Elements.	Barley, per cent.	Maize, per cent.	Rice, per cent.
Starch	63.00	65.50	74.00
Starch gum	2.00	—	—
Gluten	11.35	10.50	5.00
Fibre	7.00	4.00	3.00
Fatty matter	2.00	6.00	—
Salts	1.65	1.50	5.00
Water	13.00	12.00	13.00

Now, in the case of barley, the constituents in the above table are produced by the plant obtaining from the soil and air in order to build up the barley corn the following materials:—Silica, 32.73; phosphoric acid, 31.69; sulphuric acid, 0.79; lime, 1.48; magnesia, 7.45; peroxide of iron, 0.51; potash, 20.77; and soda, 4.56 per cent., as shown by the analysis of its ash. Under these circumstances we can understand how important it is for the farmer to select seed barley that will suit the nature of his land, as the constituents of the soil

influence the verdict of the purchaser on the grain grown. At this time of the year it is of interest to watch the development of the germ into the young plant, after it has been sown under favourable conditions, in order to see its action in obtaining the plant nourishment from its surroundings, and so the growth of the root must next be dealt with.

THE CONSERVATION OF WILTED MAIZE.

By H. C. QUODLING, Manager of the State Farm, Hermitage.

Probably never before in the history of agricultural land settlement in Queensland has such an unprecedented season as 1902 been experienced.

The average rainfall for Warwick per annum is 29.29 inches from records extending over 36 years; the greatest rainfall being 53.26 inches, during 1867, and the least being 16.03 inches, during 1865.

Appended are the records taken at Hermitage during 1902:—

Month.	rainfall.	No. of Rainy Days.
January	2.35	6
February	1.55	3
March	1.07	2
April	0.13	2
May	0.33	3
June	0.37	4
July	0.05	1
August	1.03	6
September	0.80	4
October	2.89	7
November	3.76	6
December	4.43	8
	18.76	52

The weather during January, 1903, and more particularly in the first week, when shade temperatures registered from 100 degrees to 105 degrees Fahr., was responsible for a great deal of damage to existing maize crops.

In a *résumé* of the past season, the above figures show the impossibility of obtaining any yield from wheat and kindred seasonable plants. Owing to the almost universal failure of these crops, large areas of maize were sown in September and October.

(In a few instances in this district, light crops of cereals were reaped, but each locality got the benefit of isolated storms.)

During December, a most noticeable feature was the abnormal growth of maize crops, which caused weak and over-succulent stalks. In their endeavour to reproduce themselves, plants rapidly "tasselled," but owing to the excessive evaporation and heat, accompanied by hot winds, it was soon only too evident that a grain crop was impossible, except in odd patches favoured by washed soil and soakage.

With no wheaten straw and very little lucerne to fall back upon, farmers were compelled to make provision for the exigencies of the coming winter.

Such seasons will most assuredly come again, and it behoves agriculturists to turn everything to account which will assist to keep stock alive, so that their several products may not be lost.

It is not suggested that maize stalks, affected by drought or wilted by hot winds at tasselling time, are likely to come into much favour as a commercial crop, after curing, principally on account of the cost of handling, which almost equals anything like a fair valuation of the product, but the securing of a quantity of rough fodder is not to be despised.

Maize, on account of its bulk and difficulty in handling, has deterred many from tackling it in large quantities, on account of want of labour-saving machinery, and the risk from moulding when put into bulk.

The most economical method of handling is undoubtedly in sheaves cut with the corn reaper and binder, and when the crop is not too far advanced on the down grade, the best results are obtained by making silage of it.

It is not proposed to deal with silage-making here, but rather to give an outline of the different methods of handling "wilted" crops of maize, so that they may be turned to account.

Owing to the lightness of the stalks this season—firstly, from dry weather, and, secondly, from the more general selection of light-stalked, quick-maturing varieties—a large proportion of the crops could be cut and bound with ordinary makes of open-backed reapers and binders.

Where hand labour has to be resorted to on scrub lands or inaccessible places, it is customary to cut with a light cane knife and gather the stalks into bundles, preparatory to putting them up into cone-shaped stooks, which require drawing together near the top with a rope and then tying with some strong fibre, such as hemp, bottle-tree, or anything available, or, failing these, doubled binder twine.

Another method is to rig up a sledge with a short stout scythe blade, slanting back at an angle of about 45 degrees, with several inches projecting. Various methods are in vogue as to the manner in which the blade is stayed and the amount of cutting edge exposed, but in setting it a slight bevel upwards generally gives most satisfaction. This single-horse cutter will be found most useful in dealing with standing cornstalks, after removal of the crop, when rotary stalk-choppers are not available.

An improved kind of cutter for one horse, with a single pivoted wheel in front, is made by framing together three pieces of 5 inches by 2 inches sawn hardwood, each piece about 4 feet 6 inches long, and "hinging" the two outer pieces to the centre piece in a triangular shape, so that by rigging up two pieces of 1½-inch by ½-inch iron, and overlapping them on the centre runner at the back of the frame, they can be secured with a set screw and adjusted to any reasonable width of rows. A scythe blade is attached as above stated.

In order that the stalks may be laid down in a regular position, it is necessary to attach and fix a guide rod at the front end of the sledge, then curve it slightly upward and outward in a gradual sweep, beyond the end of the blade, supporting the rod by means of a standard.

Another improved single-horse cutter is made up of a rectangular boarded framework, mounted on three small broad-tired wheels, the front one working on a pivot. Hinged on to each side of the machine are two rectangular plates faced with adjustable bevelled-edged steel blades.

Two adjustable seats are fixed to the framework for the operators to sit on. In driving along two rows of stalks are dealt with, each operator gathering an armful as it is cut and then stopping to deposit it at the back of the machine.

The advantage of this machine is, that two rows are dealt with at the same time, and the stalks are gathered in bundles, which facilitates handling.

The different makes of corn-binders on the market have more or less proved themselves the most effective labour-saving machines, being capable of dealing with several acres a day.

The importance of having such a bulky crop bound in convenient-sized sheaves simplifies and lessens the cost of all subsequent handling.

The curing process is generally a lengthy one, and has to be thorough to prevent the stalks moulding in bulk. Where it is necessary to get on to the land shortly after cutting, a convenient method is to cart off the sheaves after wilting for a couple of days, and erect the stooks close to where they are required. If well put up, drawn tight with rope, then tied near the top, they will stand for a considerable time, and weather well, thus overcoming the heavy work of stacking.

When stooks are erected in lines in the field, ploughing may be proceeded with, leaving the strips occupied untouched, to be dealt with later. In

stacking large quantities, much labour can be saved by erecting a mast and spar with tackle, and pulling up a number of sheaves at one time with a horse.

If steam-power "shredders" are available, the fodder can be carted direct to machine after curing in the field, which, after being dealt with, is delivered into the barn or wherever required by means of a strong air blast. In this form a rough fodder is torn up and intermixed, preventing much loss of the coarse parts, which always occurs in the usual method of feeding out.

An analysis of "maize straw" will indicate its feeding value (taken from *Bell's Weekly Messenger*):—

Ash.	Water.	Albuminoids.	Carbohydrates.	Fats.
4.1	15.1	3.0	37.0	0.3

EARTH OR PEA NUTS.

From inquiries lately made in this State by a Southern firm of oilmakers, it would appear that there is a possibility that in time pea-nuts will be in great demand for oil-making purposes as well as for oil-cake. Whether they will command such a price as will enable the Queensland farmer to grow them to a profit is a matter of conjecture at present. A few years ago, a correspondent at Nerang informed us that he had obtained 2d. per lb. for some he grew. The average crop ranges, according to the season, from 1,400 lb. to 2,300 lb. per acre. This would mean a gross return at 2d. per lb. of from £11 to £19 per acre.

The cultivation of pea-nut is very simple, but the choice of soil is an important factor towards success. The soil must be rich in lime. No matter how rich it may be in other constituents, if lime is absent the crop will prove a failure. There will be plenty of vines, but few nuts. If lime is not naturally present in the soil, it must be supplied at the rate of 2,000 lb. per acre, or, if the article is scarce, it may be sown in the drills, when 800 lb. or 1,000 lb. will suffice. Lime may also, in case of necessity, be applied after sowing; but, although the results are fairly satisfactory, the practice is not to be recommended. Any soil rich in lime will produce a crop of earth-nuts, but the best is a light grey or yellow loamy soil not too sandy. The reason for choosing a light-coloured soil is that pea-nuts acquire the colour of the soil they are grown in, and, as the lightest coloured nuts bring the highest prices, preference should be given to a light-coloured soil. The lightest coloured nuts are produced from a dry, sandy loam, and the darkest from a damp soil rich in humus. Another advantage of the light soil is that when the nuts are harvested no soil clings to them, as is the case in heavy dark soils. Nuts grown on this light-coloured soil are worth 10 per cent. more than those grown on black soil. As the pea-nut is an exhausting crop, it is well to observe a rotation in its cultivation. A crop of maize, for instance, should follow or precede the nut crop. As on our light soils a large amount of manure would probably be required from time to time, a good plan is to turn under a green crop after the first crop of nuts. When this has resolved itself into humus the ground must be again ploughed, and from 600 to 800 lb. of lime, together with 200 lb. of superphosphate, should be applied. Now a crop of sweet potatoes may be grown, and after this the ground may be sown with pea-nuts, again applying the above quantities of lime and superphosphate. The vines, if not required for fodder, should be ploughed under, as they form an excellent green manure.

There are several kinds of pea-nuts—namely, the white and brown Malayan, the North American red, which contains the least oil, and is only grown for eating purposes, and the white Virginian, Carolina, or African. The difference between these consists mainly in size. The Carolina variety is 25 per cent. heavier than any other, and, as it contains the most oil, is the best to plant. The least frost will destroy the germ of the nuts, but this does not affect their market value. Sweating or gathering before the nuts are ripe will

render them useless for seed purposes. Therefore, great care must be exercised in the selection of seed. Only the ripest, fullest, and cleanest should be used.

The land destined for the crop must be ploughed from 4 to 5 inches deep, and harrowed down fine. The object of shallow ploughing is to secure a firm bed on which the nuts may rest. If the land is ploughed deeply, the roots run down to some depth, and the nuts then take longer to ripen, are subject to many dangers, and are more difficult to take up. The land must be marked off in rows $4\frac{1}{2}$ feet one way and $2\frac{1}{2}$ feet the other. At the intersection of the drills two or three seeds are dropped, and covered with an inch of soil. The young plants will appear in about a fortnight, according to the weather. Then all misses must be filled up, and the ground kept thoroughly clean until the blossoms appear, when the plants may be left to themselves.

When the vines have quite died off, either naturally or after a frost, harvesting should begin. The nuts should never be harvested in wet weather. First, the vines are cut away with a hook or other convenient implement, then the stem to which the nuts are attached below are drawn out by hand, shaken to remove any earth adhering to them, and laid down on the row. Next day they are taken up and laid on a platform of straw with straw sides. A post is put into the ground in the centre, and round this the stems are heaped, with the roots on the inside. When the heap is high enough it is covered, to protect the nuts from rain. Two weeks later the stripping of the nuts begins. This is best done in the field, except in rainy weather, when they should be carted to a barn. The strippers can pick about from 60 to 80 lb. of nuts per day, but this is too slow and expensive for the large grower. There are machines made in America which can be driven by hand, steam, or horse-power. The hand machine will turn out 600 lb. and the power machines 1,800 lb. of nuts daily. They are of very simple construction, and are fed in the same manner as a threshing machine. As this machine, however, makes no distinction between ripe and unripe nuts, the latter have to be afterwards separated by hand. But another machine, "Crocker's Separator," soon appeared, which separates the nuts into three grades. The unripe ones, being the heaviest, fall into one compartment, and the ripe and lighter nuts into another. This machine will grade from 16,000 to 20,000 lb. of nuts per day with the labour of four men.

The nuts being graded must now be spread out to dry for several days, and this drying must be thorough, as imperfectly dried nuts sweat and become dark, and lose 50 per cent. of their value. The nuts are usually sold unhulled, packed in sacks. If a planter wishes to hull them, and so obtain a higher price for his product, there is a machine provided for the purpose called "Crocker's Pea-nut Sheller."

[We understand that the Health Food Company, Arcade, Edward street, Brisbane, are purchasers of pea-nuts, from which are made various kinds of food for vegetarians.—Ed. *Q.A.J.*]

THE QUEENSLAND AGRICULTURAL COLLEGE.

Droughts and floods are no respecters of persons or places. They smite alike the property of the highest and of the lowest in the land. Of ordinary floods little has to be said, and that little is in their favour. They rise slowly, as a rule, and so give time to the dwellers in low-lying districts to remove their goods and their stock to places of safety. They linger but a few days on the land, and then retire, leaving behind masses of destroyed vegetation on the cultivated fields; but, as compensation for such devastation, they also leave a deposit of rich silt, which is equal to a heavy covering of valuable fertilisers. A drought, on the other hand, is a far more terrible enemy. It does not come on suddenly, but by insidious advances. The wisest forecasters of the seasons cannot say how long it will last, or what its intensity will be. Day by day the anxious grazier or farmer watches his stock or his crops failing. Then, perhaps, the heavens will be overcast, and hope springs up in every breast. A

few light showers fall, and matters begin to look brighter, when once more the drying winds and the parching rays of the sun exercise their baneful influence on vegetable and consequently on animal life, and the land is held in a closer grip of the dreaded drought.

Such a misfortune has of late years befallen the whole of Southern and Western Queensland, and throughout the length and breadth of the land there was scarcely a vestige of green herbage to be seen. In common with the rest of the rural community, the lands of the Queensland Agricultural College felt the effects of the dry seasons. Crop after crop was sown; the most careful cultivation was carried on to form a fine tilth, and thus prevent the evaporation of whatever moisture remained in the subsoil. But all was of no avail, and at last all attempts at raising crops were abandoned. The horses and dairy stock were sent away to the coast to save their lives, and the busy scenes on the most magnificent farm in the Gatton district became things of the past.

But at the end of the year 1902 a great change took place in the atmospheric conditions. Copious rains fell, the creeks ran full once more, the water in lagoons and waterholes rose to its normal good season level, and, as if by magic, the brown, bare soil was covered with a delicate carpet of emerald green. Now was the time for the energetic farmer to prepare for the coming good seasons, and the Principal of the College and his staff seized the propitious moment to make up for past discouragements. Numerous teams of horses, ploughs, harrows, seed drills, rollers, and all manner of agricultural implements used for tormenting the now yielding soil were set busily to work. From daylight till dark, Mr. Mahou and his myrmidons—instructors, field-hands, and students—toiled to bring the land once more under subjection. In an incredibly short space of time various crops, such as maize, lucerne, millets, sorghum, and all such crops as are needed for the feeding of stock, sprang from the fertile soil. As far as the eye could reach, there could be seen waving, verdant fields. The dairy stock was brought back from the coast, and within four months rich crops were being garnered. The cattle, sheep, and pigs again looked fat, sleek, and contented, whilst the hum of the separator and the throbbing of the engine announced that the dairy work was once more in full swing.

On arrival at the College siding, the visitor is struck by the appearance of the paddocks adjoining the railway line. The fences are almost hidden by the tall, luxuriant grass now in flower—grass which would have put hundreds of pounds into the College treasury had it been available, to the exclusion, of course, of other farms in the drought-stricken country, only six months ago. To-day, here as elsewhere, all over the coast and Downs country, it scarcely has any value. All the stock are rolling fat, and, choosing only the choicest of the feed, make no impression upon this vast wealth of verdure. Two or three years ago an avenue of plane-trees was planted on the mile-long road leading from the railway station to the College. These have for the most part failed, owing, some say, to drought, some attributing the failure to too much wet after they were planted. What trees would be most suitable to both conditions is a problem not yet solved. Willows, camphor laurels, weeping figs, pepperinas, and many other trees, which thrive in most localities, have been suggested, but all have had some objection urged against them. It seems to the writer that the best way to settle the question would be to plant all the varieties, and be guided by the survival of the fittest after a series of years. Posterity would thus be benefited by practical experiment. On reaching the College we drive up to what is known as the administrative building. This contains several large rooms, such as a class-room, capable of seating all the students in the College, the Principal's office, students' reading-room, visitors' room, and the secretary's office. A very wide veranda runs round the whole building. Immediately behind this structure are the dining-hall, kitchens, and stewards' quarters, and between the two are located three dormitories for the students, two of whom occupy each room. The rooms are furnished with bedstead, table, and chairs, and are models of neatness, many of them being adorned with

tasteful photographs and pictures. Beneath the dormitories are a carpenter's shop, replete with every appliance required for building, making, and repairing all the woodwork of the establishment, and shelters for light machinery, &c. These buildings are kept in splendid order, and give the impression that they have only lately been built. The dining-hall is an airy, lofty room, where meals are served in good style. The Principal, the masters, and instructors in the various branches taught, all take their meals here. Everything is well and tastefully cooked, and three stewards wait at table under the surveillance of the chief steward, Mr. Johnson, who served with credit as sergeant-major in the Bushveldt Carbineers during the late South African war. The students' table is supplied with all the vegetables and fruits in season grown on the farm.

The Principal's house is a very elegant modern building, with lofty, well-ventilated rooms and wide verandas. All the rooms are lighted by electricity. It may here be stated that the electric light is laid on in nearly all the buildings, as well as in the milking-sheds, stables, and dairy. From the hill on which the buildings stand a fine view is obtained on one side of the country adjoining and beyond the railway line, as far as the hills beyond Forest Hill and Laidley. In the opposite direction the view embraces most of the cultivation land and much of the country on the western side of Lockyer Creek, which forms the boundary of the farm. No more picturesque and healthy site could have been chosen for the establishment of a college. As the hill slopes away on all sides, and the soil is light and porous, the natural drainage is perfect.

Passing towards the farm, the first building approached is the red-tiled dairy. This establishment is a perfect model of cleanliness, neatness, and order. Every machine and utensils used in the manufacture of butter and cheese is spotlessly clean. One would expect to find some odour of lacteal products about the cement-floored rooms, but there is absolutely no smell to indicate their existence. In one portion of the building there are two cold storage rooms, cooled by a refrigerating machine on the veranda. A 10-horse-power engine drives the necessary machinery, as well as the dynamo which furnishes the electric light. A second and smaller engine performs other useful duties. Cream separators, milk-testers, butter-workers, cheese press, scales, and, in fact, all the paraphernalia of an up-to-date factory are to be seen on all sides. It would be difficult to imagine a more perfect establishment, and it deservedly received great praise from that most critical visitor, Dr. Nicolas Krukoff, the representative of the Russian Minister for Agriculture.

Leaving the dairy, we pass on to the milking-shed. Here the visitor is again struck by the perfect cleanliness of the stalls and passages. Unless the cows are actually in the place, there is little to indicate that any animal ever enters it. The floors—cemented—are all scrupulously washed down, and then whitewashed. Every cow has its own stall, and knows it so well that when some 26 cows come in to be milked they quietly walk along, each to her own. There is no pushing or bellowing or scrambling, but all is conducted quietly and gently, under the superintendence of Mr. Meehan, chief herdsman. The cows are, as a rule, very gentle, and few require a leg-rope. The students told off for milking sit quietly on their *iron* stools—a capital idea, by the way—and without a word carry on their work well and expeditiously. The iron stools are a great improvement on the old-fashioned wooden ones, which were always liable to be broken. They are very light, consisting merely of a ring of iron with three light iron legs welded to it. Water is laid on everywhere, and it is freely used on the cattle and on the premises. Above, is a fodder loft, from which the cows' feed passes down two wooden spouts into a trolley running on rails between the two rows of stalls. The gates are so arranged that as soon as the first batch of cows is milked they pass out at a gate opposite to the one they entered by, and thus do not get boxed with the fresh lot entering. All the milk is weighed and strained before it is sent on to the dairy, and the results from each cow are noted twice a day in a book kept for the purpose.

to be afterwards entered into the regular set of books in the office. There are several excellent breeds of dairy cattle kept, comprising Ayrshires, Jerseys, Shorthorns, South Coast, Grade Jerseys, Grade Shorthorns, Holstein-Short-horns, and Holstein-Devons. The College also possesses the only Guernsey heifer in the States, as well as a fine Guernsey bull. We refer our readers to the report on the College herd, appearing monthly in the *Queensland Agricultural Journal*, for all information as to the milking properties of the cows. All the liquid draining from the milking-shed passes by an underground drain outside the building into a concreted tank, where it is mixed with water, and carted on to the fields as required. Several fine bulls, both young and of more mature age, belong to the dairy herd, of which, by the way, 56 cows are being milked twice daily. Amongst the more valuable bulls are the following:—Holstein, Friesland; Guernsey, Apostle; Jersey, Chieftain; Ayrshire, Scotch Jock; Shorthorn, Duke of Athol, and another Shorthorn named Comet. They are all very gentle, and give little trouble, but visitors are warned to keep their eye on the Apostle, who, like a certain other apostle, is inclined to use his lethal weapons rather viciously. Altogether there are 250 head of cattle, including bullocks for domestic use, on the farm. During our visit, the bulls were all vigorously soaped, scrubbed, and hosed down, in preparation for being photographed. Leaving the yards at the milking-shed, we come to a spacious implement-shed, large enough to contain all the farm implements and machines, of which there are great numbers designed for ploughing, sowing, drilling, reaping, raking, mowing, threshing, road and ditch making, and many other works incidental to high-class farming. Adjoining this shed are roomy loose boxes and stables, harness and feed rooms. All are kept in great order, and cleanliness is the order of the day.

The horse stock consists mainly of farm horses, of which about 30 are at work every day. They are very fine, well-fed, well-groomed animals. Black Watch, the Clydesdale stallion which has often received notice in these pages, is as handsome and frolicsome as of yore. He also had his toilet made before being photographed. Of riding horses belonging to the College there are not many, and not much can be said in favour of the few there are. A fine pair of greys, belonging to the Principal, is generally used for bringing visitors to the College from the railway siding.

We next visit the chaff-house, where students are busy with engine and chaff-cutter, cutting up tons of lucerne hay into mountains of chaff. Near by are several large stacks of hay, one of which was being thatched by the students, who quickly pick up the art of neat thatching. There are three silos, two filled and hermetically closed, and the third in process of being filled. The piggeries next claim attention. These are laid out in the most suitable manner for cleanliness, for ease in feeding, and for removing the so-called unclean beasts from one part of the building to the other, or thence to the portion of the paddocks devoted to their pastimes. The pens all have their particular occupants. Thus, in one line are boars of different breeds; in another, sows without litters; in another, the mothers and their progeny. The pigs are all in a state of perfect cleanliness, as well as their feeding and drinking troughs. The sties are well-littered down with clean straw, and the attendant appears to be a friend of the wickedest boar, or sow with a litter, in the place. Of course, they are not always penned up. At proper times and seasons they have full liberty to roam and root over certain paddocks. The food is mostly boiled for them, and they seem to thrive well. Amongst the breeds are the long-snouted, red-haired Tamworths, Middle Yorks, Essex, Improved Berkshires, the latter being the best paying animals, owing to their coming so rapidly into flesh. There are 170 pigs on the premises, and orders are received from all parts of the State for the stock.

Of sheep there are 200. In addition to supplying food for the establishment, they are used for the purpose of instructing the students in wool classing and grading.

The poultry-yard is very neatly and conveniently constructed. For every breed of poultry there is a separate house, closed in and roofed with ruberoid. The perches are elevated about 18 inches from the ground, and are all on the same level, so that the fowls, on going to roost, do not fight for the highest perch and inconveniently overcrowd it. Each house has a fair-sized run attached to it, closed in with wire netting at the sides. It would certainly be desirable to also close the top with netting to save loss by the attacks of crows and hawks. Mr. Hindes, who manages this department, stated that out of 400 good, strong chicks he only reared 100, in consequence of these carnivorous birds constantly carrying some away. The breeds at present in the yards are Black and Buff Orpingtons, Minorcas, Silver-laced and White Wyandottes, Light Brahmas, Black Spanish, Silver-grey Dorking, old English Black-red Game, Langshans, and White Leghorns. There must be some 200 fowls of the various varieties here, all perfectly free from disease. They are fed and reared on correct principles, and have perfectly clean houses, clean water, and the run of a considerable area of grass land. All the pens, however, would be the better for a little more shade to protect them from sun, rain, and cold winds.

Amongst the neatly-built houses on the hill are those of the farm overseer, the veteran Mr. Alex. Watt, a well-known Logan farmer and sugar-planter; Mr. Meehan, the herdsman's house; that of Mr. Pitt, the secretary and science master; and the men's quarters. The handsome laboratory with its class rooms and the gymnasium complete the list.

A good road, which would, however, be the better for being metalled, leads through the farm to the Lockyer Creek, crossing the Gatton public road. On both sides, the cultivation ground shows a wealth of maize, panicum, millets, sorghum, lucerne, potatoes, swede turnips just planted out, barley, and a field of magnificent broom corn 11 feet high, the large heads just beginning to bend down and straighten by the weight of the seeds. Further on there is a field of young lucerne just coming into leaf. Throughout the whole field there is not a weed to be seen, showing how carefully and thoroughly the ground had been worked previous to sowing the seed. Another field of 25 acres of lucerne has been kept growing by irrigation, which is done by means of pipes and drains, a plentiful supply of water being pumped by a 10-horse power engine from the creek. This engine also drives the water right up the hill into an elevated 10,000-gallon iron tank, whence all the buildings are supplied and water is conveyed to the railway and other paddocks. Everywhere in those paddocks the grass is as high as the fence, and it seems a pity that no use can be found for it, feed of all kinds being so superabundant. A large field, intended for wheat in May, has been so prolific in grass, thistles, and other vegetation that a mowing machine has to be constantly kept going to have it in readiness for ploughing when the time comes.

On the bank of the creek is the horticulturist's house, close to the vegetable garden, orchard, and vineyard. The garden is of large extent, and all the vegetables are produced by irrigation. The soil is the richest on the farm, and produces large crops of all kinds of European vegetables. Next to it is a field of strawberries, and an orchard of citrus, plum, apple, pear, fig, and other trees. The vineyard adjoins the orchard, and is very prolific in the grape season. Beyond the orchard, some large areas of land have been cleared of timber, and are ready for the plough. In one of them was a herd of milking cows, all well-bred, and so sleek, fat, and contented that they almost allowed themselves to be run over before they would lazily move out of the way of the buggy in which we made our peregrination. There are some fine waterholes of considerable depth in the creek, where the students bathe, and where good fish are sometimes taken by means of net or gun, as they rarely will take a bait. Hares are very numerous in the outside paddocks, but they do not appear to do any damage, and few people take the trouble to shoot them. All the buildings are surrounded by pretty flower gardens, and Mr. Tobin, the gardener, takes just pride in the beautiful effects he produces by the blended bloom of various shrubs and flowers and the variety of flowering creepers which climb up the verandas.

Opposite the Principal's house is a small orchard of citrus fruits, apples, pears, plums, almonds, and olives. The soil here is quite different from that on the rest of the farm. It consists of a light, porous, sandy loam, suitable apparently for fruit trees, vines, and horticulture. Tobacco has been tried here, but, unfortunately, during a very dry summer, when, in spite of constant watering and cultivation, the crop was a failure. As for the crops now growing on the College farm, they cover about 214 acres, and comprise:—Cow-peas, 5 acres; mangolds, $2\frac{3}{4}$ acres; swedes, 2 acres; carrots, $\frac{1}{4}$ acre; maize, 33 acres; maize and pumpkins, 5 acres; old lucerne, 70 acres; new lucerne, 15 acres; broom millet, $2\frac{1}{2}$ acres; sorghum, 1 acre; amber cane, $7\frac{3}{4}$ acres; panicum, 33 acres; potatoes, $3\frac{1}{2}$ acres; wheat, 14 acres; Cape barley, 5 acres; paspalum, 9 acres. All are growing vigorously, and the sight of so much verdure, after seasons such as have lately been experienced, is evidence that, with facilities for irrigation, the College fields would always bring forth abundant crops independent of any rainfall.

The students, of whom there are 64, are expected to go through a three years' training, although some are, for various reasons, only able to spend one or two years at the College. In the first case, they receive instruction in all the technical, theoretical, and practical branches of study laid down in the curriculum. A portion of them attend the class-rooms on one day, and on the next go to work in the field, carpenter's and blacksmith's shops, the dairy, piggeries, stables, &c. They are taught to do all the necessary work in these establishments. They learn all the mechanism of steam engines, complicated farm implements, and in time are expected to drive the engines, work their own horse teams, and do all the horse-shoeing and the repairs to implements, drays, and harness. They are regularly examined in these duties, both by written, oral, and practical work. Veterinary science is also practically taught. Thus, a diligent student, who has gone through the three years' course, leaves the institution with a fair knowledge of several trades, besides being competent to start farming, dairying, and pig-breeding on his own account, or to manage another person's business. A student remaining for a shorter term is allowed to devote his attention either to the dairy, the farm, or to these combined, as the time at his disposal is too short to admit of his getting even a rudimentary knowledge of all the subjects. Thus the College affords a splendid opportunity to young men to obtain a thorough practical knowledge of general farming, at so nominal a cost that it may practically be called a free education plus the cost of board and lodging.

MIXING ARTIFICIAL MANURES.

The British Board of Agriculture have published a leaflet on the use of artificial manures, and directions are given how to mix them to obtain the best result. The following "cautions" are worth noting:—

A word of caution may be given as regards the mixing of artificials. Probably it is now universally known that sulphate of ammonia must not be mixed with any manure holding free lime, notably basic slag, and precipitated phosphate. The immediate result of making such a mixture is the liberation of free ammonia, whose presence in the air can at once be detected by its pungent odour. If it is desired to apply sulphate of ammonia with one of these substances to any particular area of ground, the phosphate should be put on a month or more before the other substance. Sulphate of ammonia may, however, be mixed with the other ordinary manures, such as superphosphate, dissolved bones, bonemeal, kainit, sulphate and muriate of potash, and nitrate of soda. Nitrate of soda should not be mixed with superphosphate, dissolved bones, or dissolved guano. Not only does such a mixture result in the loss of more or less nitrogen, but the mass is apt to become sticky and difficult to sow. Superphosphate and dissolved bones should not be mixed with basic slag or precipitated phosphate, as this results in the soluble phosphate of the super. or dissolved bones becoming insoluble.

Potash manures (kainit and sulphate and muriate of potash) should not be mixed for more than a few hours with any "dissolved" manure (*e.g.*, superphosphate and dissolved bones), not because anything is lost, but simply because the mass becomes smeary and unsowable.

Generally speaking, the sooner a mixture of manures is sown after it is made the better. Some mixtures, as has been indicated, get smeary, others get lumpy, while others, like basic slag and kainit, may actually become a hard, solid, stone-like mass, which the ordinary appliances of the farmer are insufficient to deal with.

SILAGE AS A FOOD FOR DOMESTIC ANIMALS.

MODE OF PRESERVING AND FEEDING SAME.

By JOHN MAHON, Principal of the Queensland Agricultural College.

The history of the silo dates back many generations. Ancient writers speak of the practice of burying grain underground to save it for future use or to hide it from their enemies, and the evidence at hand goes to show that semi-barbaric peoples in many parts of the world have known and practised this method. Green forage was preserved in the same way in the early history of the races of Northern Europe when the uncertainty of the weather rendered difficult the proper saving of hay. It was not, however, until the last 60 years that the method of preserving fodder in the silo became better known. One of the earliest advocates of silage was a Mr. Reiklen, a German. The dissemination of his knowledge on the subject caused a large amount of experimentation among the German and French farmers. A French author, Auguste Goffart, published the first work on silage in 1877; this embodies 25 years' experience on the matter. The book is entitled "Manual of the Culture and Siloing of Maize and Other Green Crops." Goffart, having brought the matter of siloing so clearly before the notice of the farmers, may justly claim to be the "Father of Modern Silage." In 1875 the Press of the United States made known the European experience. Goffart's book was translated in 1879 by Mr. J. B. Brown, of New York. This translation, as well as Mr. J. N. Bailey's "Book of Ensilage," published in 1880, first made the subject of ensilage generally known among American farmers, and, since that time, many thousands of silos have been built and filled each year. The process of siloing fodder is largely a series of fermentation processes. Bacteria (minute germs) pass into the silo with the fodder, and after a short time begin to grow and multiply in it. The activity of these is soon discernible through the heating of the mass, and the formation of acid in the fodder. The more air there is at the disposal of the bacteria, the further the fermentation will progress, and, if a large amount be admitted, putrefactive bacteria will continue the work of the acid bacteria, and the result will be a rotten silage. If no further supply of air be at hand than that which remains in the interstices between the siloed fodder, the bacteria will gradually die out, or only such forms will survive as are able to grow in the absence of the oxygen of the air. We know that no silage fit to be eaten can be made in the presence of air; the silo must, therefore, be airtight, and the fodder well packed, so as to exclude as much air as possible.

There is no gainsaying the fact that the success of our dairy farmers is dependent to a large extent on their producing a cheap succulent food to supplement the natural pasturage, not only in time of drought, but also during the winter months, when frosts and cold weather retard the growth of grass and herbage. The main factors in this connection are the cost of production, and the food that will produce the greatest yield of milk at the smallest cost. These matters must be determined by surrounding circumstances, which of course differ very much in the various districts. Regarding the conservation of feed under various modes, it may be truthfully repeated that no farm upon which live stock are kept is perfect without the silo, not because of the feeding value of silage alone, but because it is a receptacle for succulent crops which, through

dry weather or other causes, may fail to produce a crop of grain, and can be saved as a fodder in the silo only. Then, again, in seasons of plentiful growth, green feed which may not be required for immediate use can be conserved in the form of silage only, moist weather preventing its being saved as hay. It must be admitted that ensilage prepared by the aid of modern machinery is an economical food. Much has been said and written regarding the value of corn silage as a ration, but no person who has had practical experience in feeding it alone can conscientiously say that it is anything more than half a ration, and farm stock cannot subsist on it any more than man can hope to live by bread alone. For this reason, a certain amount of hay for mixing purposes should be saved each year. If, however, cow-pea, beans, or clovers, all of which are rich in protein, were mixed in the siloing of maize, we could then claim to have a full and well-balanced ration; a mixture of any of the above crops improves the silage by counteracting the acid reaction of the corn ensilage. Analyses show that corn ensilage contains 1.20 per cent. of albuminous matter, whereas well-saved oaten hay contains 6.50 per cent. The chemical change which takes place in the ensilage during its early stage in the silo destroys a certain portion of its nutritive value, especially in the case of starch and sugar. Excessive moisture brings about greater fermentation, and, apparently, acidity is the result of fermentation. At any rate, experiments tend to show that acidity and loss of dry matter go hand in hand and bring about loss in the carbo-hydrates and allied substances. The following figures may be taken as a reasonable average composition of corn ensilage, green lucerne, and mixed hay:—

—	Moisture.	Ash.	Protein.	Crude Fibre.	Nitrogen (free extr.)	Fat.
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Corn silage ...	78.6	1.0	2.0	5.4	11.5	1.5
Green lucerne ...	71.9	2.4	6.6	7.3	10.1	1.7
Mixed hay ...	10.1	5.9	10.2	32.2	36.1	5.5

These figures go to prove that, though corn ensilage is a valuable ingredient in making up a ration for animals, it is inadequate for the complex wants of the animal system. It is deficient in albuminoids to nourish the muscular system, and in phosphates to build up the bones. It is because of corn having but a small proportion of albuminoids that it can be classed as a half-ration only. The American dairymen never feed on a ration of corn ensilage alone, their daily ration being usually 35 lb. of corn ensilage, 8 to 10 lb. of good hay, and 5 to 6 lb. of bran. Ground oats, pea-meal, linseed, cotton-seed meal, and other grains are frequently used in making up a ration. Corn will always command much favour because of its yielding such a great weight of succulent feed per acre; sorghum and amber cane also yield heavy crops, but make the best ensilage when saved with cow-pea, lucerne, &c. Owing to the fact that some of our sorghums and amber cane contain a great deal of sugar, the increasing tendency to fermentation is great, and these crops, if siloed alone, should be well weighted down. There appears to be but little necessity to name the numerous crops that are suitable for ensilage. Lucerne, clovers, artificial grasses, beans, peas, barley (Cape and malting), wheat, rye, maize, panicum, sorghums (when carefully saved), all make good ensilage. It is absurd to suppose that good feeding stuff can be turned out from a silo which may have been filled with weeds, ordinary bush grass, and such like stuffs; these, after they reach a certain stage of growth, become rank, sour, and deficient in the properties necessary to produce silage of even the poorest quality. In raising maize crops for silage purposes, the conditions of the soil, as in the case of growing the crops for grain, must be considered, inasmuch as most of the varieties that are suitable for the one purpose are also suitable for the other. The same method of cultivation and planting may be followed—namely, 4 feet

between and 18 inches in the rows. This crop should be cut and siloed when the grain has reached the doughy or milky stage. It is a notable fact that the food material increases rapidly in the corn in its last stage of growth, particularly the sugar and starch, and for this reason some knowledge is necessary as to the best time to commence siloing corn. Lucerne possesses most feeding-value when it is well in flower; cow-pea, when the grain is nearly ripe; sorghums and cereal crops, when the seed is well formed.

A definition of the words used in connection with the preparation of fodder under different methods may be given here. The word "silo" means an airtight structure for the storage of fodder in a succulent condition. The feed when taken out of the silo is "silage," formerly called "ensilage." "Fodder corn" means the whole corn plant. The husked plants are known as cornstalks or "stover." Maize cut and saved in the field in stooks is not ensilage, because under this system the material will have lost its succulency, and can only be saved in the form of hay; and, even when saved under this system, will, owing to the fact that the thickness of the stalk allows access of air, become very dry unless placed under cover and pressure used. Stack ensilage: The greatest objection to "stack ensilage" is the loss which occurs through the spoiling of the outside and top of the stack, which is, even under the most skilful method, at least 15 per cent. With this exception, stack ensilage is almost equal to that made in a pit or silo. Of course, there is also a certain amount of juice lost, which contains a good deal of nutrients, especially albuminoids. Stack ensilage also entails a considerable amount of labour because of its having to be lifted by hand to a considerable height and then tramped down. In making this fodder, the maize should have reached the same stage of growth as that which is intended for the silo—namely, the milk stage. The cutting is most cheaply performed by the "corn harvester," which binds the stuff in bundles of a size easily handled. The maize is carted immediately after cutting and placed in the stack, carefully and evenly spread out, with few, if any, of the stalks lying crosswise, and well tramped down. The projecting ends of the stalks on the sides of the stack must be cut by means of a cane-knife or old scythe blade, so that the sides shall be neat and vertical. The higher the construction of the stack, the better, because of the pressure required. When the stack is built to the required height, it should be finished off with straw or bush hay, and as much pressure as possible applied.

Stover, or cornstalks, may be converted into a fodder by different methods. Corn intended for this purpose should be cut when the grain has well formed, and placed in shocks of a small size to admit the free access of air, otherwise the stalks will be found to mould and decay, resulting in a rotten stuff totally unfit for food. The shocks, which should be carefully placed so as to prevent rain reaching the centre, are allowed to remain in the field until such a condition of dryness is reached that fermentation or mould will not be likely to occur when the stuff is stacked or placed in a shed. This may require six or eight weeks, according to the state of the weather. When this condition has been reached, the cobs may be picked off, and placed loosely packed in a corn-crib to further mature. The stover may then be put through the corn-shredder, and afterwards carefully packed in a barn or silo, or it may be chaffed, or closely packed and pressed by the best means available. If stacked in the open, straw or bush hay will make a good topping; if in a barn, heavy timber. In every case, the stover must be steamed before feeding to milch cows or young animals, and the ration made up with other mixtures, such as green lucerne, lucerne, oaten, or wheaten hay, steamed bran, boiled barley, &c. It is beyond all reason to suppose that corn stover of any feeding value can be saved from stuff that has been allowed to remain too long in the shocks in the field, exposed to the weather and vermin of every description. We have had this experience at the College in the early part of 1898, when some corn was cut and allowed to remain in shocks in the field for two or three months. When we attempted to remove the stuff, we found the grain destroyed by mice and weevil, and the cornstalks in such a state of decay that they were totally unfit for food. These

facts go to prove that care and attention are required in saving the corn crop under all processes. Well-saved corn stover may be compared in feeding value to good oaten straw. The construction of silos, filling same, and method of feeding silage will be dealt with in the next article.

JOHNSTON GRASS.

We have repeatedly advised farmers not to risk planting Johnston grass on their land, owing to the rapidity with which it spreads and the difficulty of eradicating it once it has taken firm hold. As will be seen from our account of Mr. Redmond's farm near Bundaberg, the Johnston grass has taken almost complete possession of one of the lucerne fields. We did not intend, however, to decry the grass in exceptional cases, such as during the late drought, when it would have been invaluable as fodder for the starving stock. In this connection a farmer writes:—"I have just been told of a farmer who saved his stock by ploughing up the roots of some Johnston grass growing on his land. Since that I have felt very small in my own esteem, because, during the drought, I had advised a man to turn out his hogs into the blady and couch grass, and let them 'root hog or die.' I knew at the time that he had a large acreage and a great tonnage of Johnston grass roots, but thought them too fibrous for pigs. My trouble now is that it never occurred to me that he had a valuable fodder for his starving stock. If Dr. Maxwell's forthcoming report gives the information as to the value of Johnston grass as a plant for ensilage, compared with maize, the former, instead of being looked upon as a noxious plant, may come to be regarded as a most valuable ensilage pit-filler, and its root crop in times of drought would be to the good."

CATTLE IN THE GULF DISTRICTS.

Mr. Caldwell (says the *Townsville Star*) was furnished with a list of the stations in the vicinity of the Gulf of Carpentaria, together with an estimate of the number of cattle on each. If the figures are correct, there need be no fear of a meat famine in North Queensland just yet. The following is the list:—McArthur River Station (Northern Territory), 10,000; Wollogorang (Northern Territory), 8,000; Westmoreland, 5,000; Turn Off Lagoon, 5,000; Lawn Hill, 23,000; Gregory Downs, 12,000; Punjaub, 6,000; Escott, 5,000; Riversleigh, 5,000; Augustus Downs, 10,000; Lorraine and Talawanta, 30,000; Fiery Downs, 10,000; Kamilaroi, 30,000; Collullah, 10,000; Granada, 10,000; Quamby, 5,000; Inverleigh, 20,000; Neumeyer Valley, 8,000; Magowra, 15,000; Milgarra, 5,000; Donor's Hill, 5,000; Undilla, 3,000; Rocklands, 35,000; Avon Downs (Northern Territory), 4,000; Alexandra (Northern Territory), 25,000; Brunette Downs (Northern Territory), 30,000; Lake Nash (Northern Territory), 25,000; Headingly, 5,000; Carandotta, 5,000; Canobie, 30,000; Boomerah, 4,000; Taaffe, 5,000; Vena Park, 10,000; Wondoola, 6,000; Ifley, 10,000; Taldora, 10,000; Millungera, 15,000; Maggierville, 3,000; Delta Downs, 10,000; Midlothian, 8,000; Miranda Downs, 10,000; Esmeralda, 10,000; Dunbar, 10,000; Strathmire, 20,000; Van Rook, 10,000; Stirling, 10,000; Rutland Plains, 2,000; Abington Downs, 5,000; Fort Constantine, 30,000; Dalgona, 30,000; Eddington, 20,000; Clonagh, 7,000; Bunda, 15,000; Devconert, 8,000; Carlton Hills, 12,000; total, 684,000.—*North Queensland Herald*.

Dairying.

THE DAIRY HERD.—QUEENSLAND AGRICULTURAL COLLEGE.
RETURNS FROM 1ST TO 30TH APRIL, 1903.

Name of Cow.	Breed.	Date of Calving.	Yield of Milk.	Per cent. Butter Fat, Babcock Test.	Commercial Butter.	Remarks.
			Lb.		Lb.	
Annie Laurie	Ayrshire ...	10 Aug., 1902	442	3.9	19.30	
Annie ...	" ...	1 Nov. "	260	4.7	13.68	
Amy ...	" ...	14 Feb., 1903	523	3.8	22.26	
Laura ...	" ...	12 July, 1902	583	3.9	25.46	
Laverock ...	" ...	14 Aug. "	506	4.0	22.67	
Lass ...	" ...	11 July "	424	4.0	18.99	With first calf
Linnett ...	" ...	10 Sept. "	610	3.7	25.28	
Lowla ...	" ...	31 Oct. "	426	3.7	17.65	
Lavina ...	" ...	5 Sept. "	529	4.0	23.70	
Lena ...	" ...	26 Feb., 1903	867	4.0	38.84	
Leesome ...	" ...	27 Feb. "	996	3.6	40.16	
Lonesome ...	" ...	28 Feb. "	486	3.6	19.59	With first calf
Renown ...	" ...	21 April, 1902	219	3.4	8.34	
Ream ...	" ...	10 Jan., 1903	495	4.2	23.28	
Ream Routhie	" ...	4 Feb. "	626	3.7	25.94	
Rosebud ...	" ...	4 Dec., 1902	711	3.8	30.26	
Ruth ...	" ...	18 Dec. "	466	3.9	20.35	
Ruby ...	" ...	24 July "	501	3.5	19.64	
Venus ...	" ...	6 April, 1903	283	3.9	12.36	With first calf
Blink ...	" ...	23 April "	175	3.9	7.64	
Bonny ...	" ...	15 May, 1902	327	4.1	15.01	
Carrie ...	Jersey	15 Sept. "	439	4.9	24.09	
Effie ...	" ...	17 Nov. "	543	5.0	30.41	
Eileen ...	" ...	4 Nov. "	415	5.0	23.24	
Ivy ...	" ...	24 Oct. "	343	4.9	17.70	
Jersey Belle	" ...	17 Jan. "	445	5.1	25.42	
Playful ...	" ...	3 July "	283	5.3	16.80	
Stumpy ...	" ...	17 Mar. "	50	5.8	3.24	Dry, 19-4-03
Dora ...	Shorthorn	12 Jan., 1903	535	3.7	22.17	
Guinea ...	" ...	9 June, 1902	49	4.4	2.41	Dry, 12-4-03
Kit ...	" ...	27 Nov. "	623	3.9	27.21	
Lucy ...	" ...	14 Aug. "	490	3.9	21.40	
Louisa ...	" ...	3 Jan., 1903	578	4.3	27.81	
Nestor ...	" ...	31 July, 1902	528	4.9	28.98	
Queenie ...	" ...	2 Sept. "	543	4.0	24.33	
Rose ...	" ...	10 April "	259	4.9	14.21	
Violet ...	" ...	6 Dec. "	572	3.5	22.42	With first calf
Winnie ...	" ...	17 June "	359	4.5	18.09	
Restless ...	" ...	23 April, 1903	175	3.4	6.66	
Plover ...	" ...	29 April "	27	3.8	1.15	
Alice ...	" ...	28 April "	20	3.8	.85	
Peggie ...	Grade Shorthorn	19 April, 1902	48	4.0	2.15	Dry, 10-4-03
Princess ...	" ...	5 June "	319	4.7	16.79	With first calf
Rosella ...	" ...	1 Dec. "	433	3.6	17.46	
Lemon ...	" ...	18 June "	413	4.0	18.50	With first calf
Vera ...	" ...	9 Mar., 1903	494	3.6	19.92	
Fancy ...	South Coast	19 Jan., 1902	18	5.0	1.0	
Grace ...	" ...	1 Sept. "	412	3.8	17.53	
Topsy ...	" ...	4 Oct., 1901	107	4.4	5.27	Dry, 15-4-03
Angel ...	Holstein Devon...	1 Feb., 1903	591	4.1	27.14	With first calf
Night ...	" ...	29 April, 1902	80	5.1	4.56	With first calf
Whitefoot ...	" ...	29 April, 1903	36	3.0	1.2	With first calf
Mona ...	Sh'rth'n	3 June, 1902	564	4.0	25.27	With first calf
Reanie ...	" ...	7 Mar. "	378	4.7	19.90	With first calf
Tussle ...	Ayrshire Sh'rth'n	10 Mar., 1903	502	4.0	22.49	With first calf
Rachael ...	" ...	29 Mar. "	458	3.9	20.00	With first calf
Nina ...	" ...	2 April "	474	3.7	19.64	With first calf
No. 46 ...	" ...	7 April "	241	3.5	13.37	With first calf
No. 48 ...	" ...	8 April "	379	3.5	14.86	With first calf
Nancy ...	" ...	12 April "	423	3.6	17.05	With first calf
Brindle ...	Grade Jersey	6 June, 1902	281	5.0	15.73	With first calf
Witch ...	" ...	13 May "	429	3.5	16.82	With first calf
Blank ...	Ayrshire " Jersey	" ...	590	4.2	27.75	With first calf
Lady Rose ...	Guernsey	2 April, 1903	367	4.6	18.91	

The herd was grazed on natural pastures only.

MILK IN POWDERED FORM (OR NUTRIUM).

By GEORGE J. JONES.

For more than 50 years efforts have been made by the scientists of nearly all the civilised countries to separate the water and the fat from milk and secure the non-fatty solids in such condition that by the simple addition of water the milk could be restored, with all its original properties unimpaired and unchangeable by time or the extreme variations of climate.

These efforts proved unsuccessful for many years. A portion of the water could be readily removed, but when concentrated to about one-sixth of its original bulk the pasty condition of the mass rendered it unmanageable, and complete desiccation became impossible without subjecting it to such a high temperature that the character of the product was completely changed, rendering it insoluble, incapable of coagulation by rennet, and reducing the digestibility, by pepsin tests, 50 per cent. The nearest approach to desiccation was condensed milk. A dry product seemed impossible without the sacrifice of all the valuable constituents of milk except the casein, and this was preserved only in an altered form after treatment with acids and alkalies, which thoroughly changed its character and impaired its nutritive qualities.

Dr. Joseph H. Campbell, a citizen of the State of Pennsylvania, who had spent a great deal of time in the study of the petroleum products, turned his attention to organic chemistry some time ago, devoting himself especially to the products of the dairy.

The development of the dairy interests of this country had reached enormous proportions. The butter industry was largely being concentrated at the creameries, and in many cases skim milk was a waste product, often thrown away. If the skim milk could be utilised so as to recover the non-fatty solids in dry, soluble, sterilised, and thoroughly peptogenic condition, the product at half the price of butter per lb. would be more valuable than the butter interest itself, as the milk would yield but 4 lb. of butter to 100 lb. of milk, while the non-fatty solids would furnish 9½ lb. of the dry powder, and the annual value would run into hundreds of millions of dollars, creating a new industry exceeding in value the wheat crop of the United States.

But even more than this. It was realised that the recovery of the non-fatty solids of milk in a dry condition would furnish milk to the tropical regions, where it was heretofore unobtainable; would permit an addition to the rations of the soldier and the sailor in the most convenient form, with the least possible waste; would be an invaluable addition to the hospital dietetics; would supply an important factor in the treatment of diabetes, Bright's disease, and other similar maladies; would furnish properly-balanced rations to all classes at the cheapest rate; and would be a general boon to humanity in maintaining vigorous normal health, allaying suffering, promoting longevity, and reducing infant mortality.

The process of development was slow; difficulties were presented at every turn, some of which for a time seemed insurmountable. But after nearly 3 years of labour, and the expenditure of nearly 100,000 dollars, success crowned the efforts and powdered milk or "Nutrium," as it is called, became a reality, and its manufacture is now a flourishing industry.

The views herewith presented show the various stages through which the milk passes at one of the three mills of the National Nutrient Company, preparatory to its shipment to the Jersey City, N.J., mill of that concern, where it is ground, bolted, and packed. In this plant there are two of the largest pebble mills in the world used in grinding the dry lumps. The product in appearance resembles fine wheat flour, and is packed suitably for safe transportation to all climates.

The milk is pumped into a large round copper vessel, where it is agitated and heated by sterilised air blasts preparatory to its being pumped into the four rectangular concentrating vessels. These concentrating tanks are provided

with a circulating medium of hot water surrounding them and coils in their interior. They are also provided with pipes and fan-shaped nozzles for the introduction of sterilised air below the surface of the milk. This air is under a pressure, and is allowed to escape when the tanks are charged with milk, and causes the water vapour to be driven off. The milk here has a violent rolling motion, greater than if boiling. The milk is thus reduced to about one-sixteenth of its volume. As the product becomes concentrated, the temperature is lowered. The opening of a valve permits the mass to fall into the large roller drums with tapered ends, which are located in a lower floor. These roller drums are tin-plated, and are perfectly smooth on the inside, with cone-shaped ends. An air blast is then introduced into the head of the drum. The latter, revolving about two turns per minute, carries the pasty product up on its side, and as it approaches the top it falls back through the dried atmosphere, the air thus carrying away the moisture. This paste soon becomes too heavy to be carried up by the revolving of the drum, and rolls into a large mass, the cone-shaped ends causing it to move unequally and twisting and grinding it into small particles. These are then conveyed to the drier drums, where the desiccation is completed.

These drier drums have a novel construction. Sterilised air is forced through a central shaft having lateral arms extending down into the mass, where the constant rolling of the drums exposes all parts to the desiccated air. When the product is bone-dry, it is conveyed to a grinder, which brings it to about the consistency of cornmeal, and it is then packed.

The proper office of powdered milk is not so much to act as a food of and by itself, but as a means of cheaply furnishing other foods with the proteids in which they are deficient, and thus restoring the balance, which is essential to health.

The successful reduction of milk to the form of a powder is an achievement of much importance to the bakers, particularly those engaged in the business in a large way. They are enabled to secure their milk supply without any possibility of interruption, and at a much lower cost. This latter is due to the fact that the dried milk can be shipped so much more economically than the milk in its original form. A 5-lb. box can be shipped at a small fraction of that of its equivalent of whole milk, and can be mixed as desired. The losses in the handling of fresh milk around the bakery are very great. Much is consumed by the men handling it, a great deal is wasted, and more is spoiled by being improperly cared for.—*Scientific American*.

STANDARD PROPERTIES TO BE ADHERED TO IN JUDGING BUTTER.

	Points.
<i>Flavour</i> .—Should be sweet, mild, and nutty ...	50
<i>Texture</i> .—Should be firm and granular ...	20
<i>Colour</i> .—Clear straw colour throughout ...	10
<i>Salting</i> .—Should be sufficiently salted, without destroying the natural flavour peculiar to butter ...	10
<i>Packing</i> .—Should have no vacuities, be free from milk and water ...	7
<i>Finish</i> .—Paper should be properly fixed, showing no waste; boxes clean and attractive ...	3
Total ...	100

The above was kindly forwarded to us by Messrs. Brown, Webb, and Co., Roma street, Brisbane.

The Horse.

BREAKING IN A HORSE.

A good horsebreaker is an acquisition to every breeder. But there are two varieties of horsebreakers. One makes it his business to shout, thrash, throw, and generally so frighten a colt that by the time he is pronounced "broken" he is generally broken-spirited. Another man takes the gentle method, never frightens the animal by uncouth yells, and blows, which the poor brute neither understands nor knows the reason for his punishment. Here is what "Agricola" writes on the subject of "Breaking Farm Horses," in the *Farmer and Stockbreeder* :—

On every farm there are, or should be, one or two youngsters to put to work. Light land farms are especially adapted for breeding, as there is always work that young horses can do, and so earn their keep, without doing themselves any harm. Two-year-olds got handy will be able to do rather more than two months' work, and then be turned away again until the autumn, when they will be ready for ploughing during the winter. In many instances, it is to be feared, sufficient time is not devoted to the "breaking in" of young horses. They are caught, haltered, and, without time being spent to "get a good mouth," they are put to the plough, and there you are, their education is about complete. True, they get used to turning in at land's end, and stop when they are told, but they have "no mouth," and you cannot steer them properly. In these days of moving, reaping, and binding machines it is necessary that a horse has a "mouth" good enough, so that he can be steered to a nicety, and this is only got by giving plenty of time during his early education. An hour or two every day spent by the farmer's son or pupils in quietly handling, leading, and then driving in lines, along roads, and in the plough fields where teams are at work, will make the youngsters very handy.

HALTERING.

The first performance when the young horse is brought in from grass (if he has been lying out during the winter) is to catch and halter him. And now will be seen the advantage of having haltered and handled him as a foal. Being not so strong at that time, less power is needed to control him, and the lesson learnt at that early age is never forgotten. The sensation of having the halter on is now not so strange, and the resistance offered is now not so great. The plan to adopt is to get the youngster into a roomy stable, either alone or in company with another (alone is preferable), and, having a good halter ready, hang the head-stall part on a forked stick; the noseband must be left wide open, and the rope greased or soaped where it passes through the loop, so that it will draw up easily. The end of the halter rope should be held in the left hand, and the forked stick in the right. The operator then commences to touch the youngster on the withers with the stick, and gradually works along the neck up to the head, and then gently gets the muzzle through the noseband of the halter and hangs the head-stall over the ears. As soon as this is accomplished the rope should be quietly but quickly drawn, and the halter is securely on. All this may be done without the shouting and thrashing one sometimes finds employed. As soon as the halter is securely "chopped," a strong rope should be attached to it, tied with a reef knot. This rope should be 5 or 6 yards long, perfectly strong, as also the halter should be, for if by any means the animal once gets free it will always be trying again. After making the rope safe, the man holding it should go out of the stable first and lead the horse after him. The rope must not be pulled (or the horse will resist, and probably throw up his head and hit it under the door frame), but left just slack

enough, so that it does not get under the legs. As soon as all are out of the stable, the first fight will commence. There should be one or more assistants to help hold the rope. It is quite necessary that the horse should try hard to get away; in fact, he may be encouraged to pull by the rope being struck. When once the animal finds he is fast he will allow himself to be turned any way. The operator should pull the horse round first one way and then another, and when any resistance is offered extra strength should be used to force him. All this should take place in a littered yard sufficiently large to allow of lunging.

Between each tussle the horse should be patted to give him confidence, and all the time quietly but firmly treated. Everything that is attempted should be carried out so that the horse is thoroughly mastered. As a rule, if the youngster be in good condition he will have made a good fight, and by the time he is a bit mastered will have had enough of it for the first day. The halter may be safely fastened up and left on. There will not be so much trouble a second time in catching, or so much resistance offered. The bit and breys may be put on, also the surcingle and side-lines, and after lunging the horse may be left to champ the bit and so "get a mouth."

All the time of "breaking in" good living is necessary, not only on account of keeping up the condition, but to keep up the spirits. It is better to bring out any bad qualities with good keep and subdue them, rather than conquer a horse when in a low condition.

LEADING AND DRIVING.

As soon as it is found a fair "mouth" is secured—that is, the horse responds to the drawing of rein and will back when required—he should be led out, and also driven in long lines. This is very necessary, as when once a horse gets in the team there is not much chance of his being driven singly. As I suggested before, a farmer's son may profitably employ a few hours a day in handling a young horse. It is well to put a crupper and hip-straps on when driving about, so that the youngster may get used to the jingling of chains and the straps hitting his sides.

A FIRST START.

A good place to put a young one for a first start is in front of a shaft horse with a load, and a gear-horse in front of him. A rope should be tied to the gear-horse's setter-stick right and left, and he is perfectly secure. The gear-horse gets him going, and the load behind will steady him. The same position may be assigned him in the plough until he is quiet enough to go double. It is not well to overtire the young ones at plough. A jaded horse will often kick. The best plan, if two are broken in at once, is to give each half-a-day; they are neither overdone, and can be used every day without any fear of doing too much at them. Such work as I suggest, with good living, will help to develop the muscles, and be better for the youngster than lying idle, and at the same time he will be earning his living.

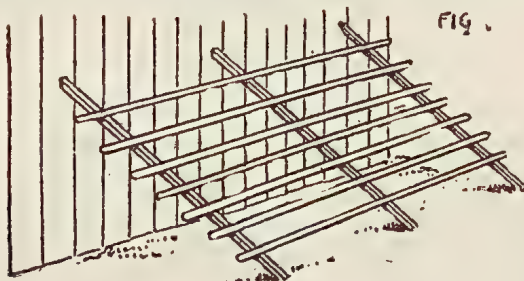
TOMATO LEAVES AS A PROTECTION AGAINST INSECTS.

A farmer in South America claims to have discovered that leaves of the tomato plant will drive insects away from other plants. He covered the tomato leaves over rare young shrubs he wished to protect from the sun and small insects, and was delighted to find that the latter left as soon as they got the odour of the tomato leaves. He then extended the same treatment to an entire row of young peach-trees, and his success was complete. To render the process more simple, he tried a decoction of the fresh tomato leaves as a spray in other trees and shrubs, and found that he had a perfectly effective weapon, which cost practically nothing. He also found that a spray of the same kind would keep flies off his horses.

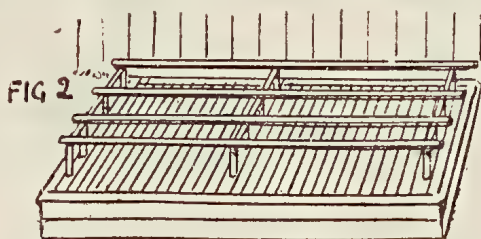
Poultry.

POULTRY ROOSTS.

Most people who keep poultry take very little trouble about the roosts. Yet these play an important part in the comfort and health of their fowls. There is a wrong and a right way of fixing them in the poultry-house. The first diagram shows the wrong way. Fowls always try and roost as high as they can. In the case of a roost such as is here shown, they will all crowd up to the top roost, with the result that the stronger birds drive off the weaker and pack the highest place to an uncomfortable degree, whilst the lower roosts are empty.



Now, take the right way of setting the roosts. They should all be of equal height. To effect this, build a flat platform to catch the droppings. Let it be about 2 feet from the floor. Nail a ledge of 3 by 1 inch batten round the edge to prevent the droppings being scattered. Now, make the perches about a foot higher than the platform, as shown in the second diagram.



These roosts should be about 15 inches apart, made of 3 by 2 inch batten, rounded and smoothed on the upper side. By this plan, the fowls will not crowd, their plumage will be kept clean, and the platform can be cleaned out daily, thus ensuring a clean house.

HEALTH IN THE POULTRY-YARD.

For many months during and since the drought most people have been feeding their fowls on whole or cracked maize, owing to the high price of wheat and other grain. Our own fowls have, for 12 months, had no other dry food. At the height of the drought, the only green food they got was grown by irrigation in the vegetable garden. Of course, they got meat scraps, bone, &c. The maize diet had no such effect as is described in the following article, which we take from the *Farmer and Stockbreeder*, England. Not one of our fowls has succumbed to any disease, except that fatal one contracted on the killing block.

LIVER DISEASE—ITS CURE AND TREATMENT.

After roup, liver disease is the most dangerous foe to be guarded against in the poultry-yard; indeed, it is a moot point whether it has not done more harm than roup to the poultry industry. When birds have roup badly they die of it, and they stop laying at the very commencement of the attack. Liver disease is longer and more insidious, and the fowls lay in the earlier stages of it; and, as it is heritable, many chickens are hatched, strong and healthy to all appearances, but with the seeds of the disease in them. Liver disease is often called "going light," for the sufficient reason that birds having it waste away to skeletons, all the while looking in tolerable health. It is caused by exposure to wet and cold, by overcrowding, and by feeding on too much starchy food, such as maize.

A good many learned professors have written on liver disease, or tuberculosis, as it should really be termed, and have discovered there is a bacillus peculiar to the form of tuberculosis in birds, and this bacillus generally gains entrance to the fowls while picking up corn soiled by the excrement of fowls suffering from the disease. This is why fowls in confined spaces are so frequently attacked by it, and why such scrupulous attention needs to be paid to cleanliness. English poultry-keepers, as a whole, do not pay enough attention to disinfecting the poultry-ground and poultry-houses. On hearing a lecture once on French methods of poultry-keeping, I was greatly struck by the importance laid on this point in France, and here evidently lies one of the reasons of their success. To repeat a remark made in my former article, we cannot afford to have disease in the poultry-yard, and French poultry-keepers, who are almost altogether utility poultry-keepers, keep this fact in mind.

EXCESSIVE MAIZE FEEDING.

The French, though, are rather fond of keeping poultry thicker on the ground than we do, hence no doubt their free use of disinfectants. The majority of farmers in this country allow their fowls plenty of space. There is then small fear, unless they are always fed in the same place, of their getting the disease through tainted ground. But, unfortunately, there is another cause, alluded to above, and that is too much maize. Nothing provokes liver disease more than continual feeding on maize, and though if the fowls have full liberty and are of active disposition they walk off in a large measure the bad effect the maize has on them, yet in all cases they will eventually succumb if the maize is continued long enough. The bad effects of maize are not so marked in winter as in summer, and, being a food rich in warmth-giving properties, it has a certain feeding value; it is its continued use which is harmful. For the heavy breeds, such as Dorkings, Langshans, Wyandottes, it is worse than for the lighter breeds, such as Leghorns, for the former are more lethargic of disposition, and do not walk off its effects as the active Leghorns do; but if birds are in close confinement, whatever the breed, they cannot take much exercise, hence maize is especially bad for them.

Prevention is far better than treatment, and this is best obtained by keeping the birds clean, giving them plenty of room, and not serving maize too freely; indeed, if liver disease has a firm hold of the birds before it is discovered, it is best not to worry about treatment, for they will be past it. When the poultry-keeper finds birds dropping dead, and notices that the excrement of others is thin and watery, he must be prepared for the worst.

Perhaps he may not be sure it is liver disease. When a fowl is found dead for no particular cause, it should be sent to a competent person for *post-mortem* examination. If the poultry-keeper does not care to do this, and if the thin condition of the fowl suggests liver disease, it will be well to open the carcass and examine the internal organs. The liver of a tuberculous fowl is brown in colour and spotty, and the spleen enlarged and covered with small tumours. Having discovered that the fowl has liver disease, do not throw the body on the manure heap, as is too often done, but bury it, sprinkling quick-

lime freely over the carcass, for it is possible part of the stock are as yet unaffected, and may be saved if proper measures are taken.

All the birds showing signs of the disease—that is to say, pale in comb and thin in condition, and also walking slightly lame (this is a sure sign of the disease)—had better be killed at once and buried in lime, for they are good for nothing, and it is only hastening the inevitable end; but those that seem all right should be moved to fresh ground and fed on oats and soft food, partly biscuit-meal, and plenty of green food, such as lettuces, while the new house should be frequently whitewashed; the ground on which the affected birds have been running should be dressed with gas lime.

It should never be forgotten by the poultry-keeper that fowls kept in big lots develop diseases more readily than those kept in smaller numbers. Fifty is the maximum number that should run together and sleep in the same house, while better results would be attained if they were divided into two lots of 25. Still, circumstances govern cases, and it may not be always possible to divide them. All attempts to keep fowls in larger numbers together (thereby saving a good deal of trouble and expense in housing) have all resulted in failures; disease has appeared and cleared off the lot. In brief, it cannot be done.

ANIMAL FOOD FOR POULTRY.

A new kind of poultry food has been successfully used in Canada, according to a report of the Department of Agriculture, and this is dried blood. At the chicken hatching and rearing stations conducted by this Department, last year, the confined chickens were fed with dried blood in their soft food until they were two months old, and made rapid development. The proportions used were 1 lb. of dried blood to 16 lb. of meal, and this food is also recommended for laying hens, though it does not appear to have been given to any except the chickens. It is pointed out that all laying fowls in confinement need animal food daily, and that hens while moulting need more of it than at any other time, as the new feathers need the nitrogenous matter that meat supplies. Very few of us, however, can secure dry blood to give to poultry, though no doubt in those cases when it could be obtained it would come far cheaper than meat meal. The latter, however, is infinitely more pleasant to handle and superior to butchers' scraps and offal, as it needs only boiling water poured over it to render it ready for use. The fact that fowls in confinement need animal food, while those at liberty on the farm can get it for themselves, is worth pointing out to those poultry-keepers who keep part of their stock in confinement and part at liberty.

POULTRY BREEDING EXTRAORDINARY!

The following poultry story is taken from the *Daily Chronicle*:—"The United States is making things hum in the poultry-yard. The Department of Agriculture is trying to develop a breed of featherless chickens for the warmer parts of the country, and claims that it has already reduced the moulting period to less than one month, and may before long succeed in doing away with it altogether. Chickens without feathers, it is hoped, having nothing to moult, will lay eggs just to keep themselves occupied. Meanwhile, a private "expert in henology" is experimenting in an opposite direction. He is trying to raise chickens with hair instead of feathers, chiefly for the Klondyke market. So far he has completely succeeded. His chickens have feathers as soft and downy as fur, and whiter than eiderdown. They cannot fly, but they are so warmly thatched that they lay eggs right through the winter almost without knowing it. They are specially recommended to Arctic explorers, who often find it difficult to keep their egg cups filled with an up-to-date article. At this rate, the chicken of the future will be either as bald as a piano or as fluffy as a Persian cat.

The Orchard.

PINEAPPLE PLANTS 60 YEARS OLD.

In answer to a correspondent inquiring whether there are pineapple plantations thriving in this State 60 years after planting, we stated in the April issue of this *Journal* that we had no experience of such aged plants. We have now been favoured by a grower in the Nundah district with the following interesting communication on the subject:—

The first pineapples grown in this State were planted in Elizabeth street, opposite the Treasury Buildings, by Mr. Hand, a missionary from India, from which country he was supposed to have brought the plants. When he left Brisbane he gave all his plants to Mr. J. G. Wagner, one of the missionaries at German Station (now Nundah). During that gentleman's absence in Sydney for several years, the pineapple plants were distributed amongst the neighbouring settlers. One of the original patches is still growing, healthy and strong, on Mr. Andrew Wagner's farm, and this patch is supposed to have been planted 60 years ago. The highest price known to have been obtained for the fruit was 8s. for a single pineapple, and this fruit was resold to the Government Residency for 10s.

We are much indebted to "Young Sucker" for this interesting piece of information.

CURING ORANGES.

Many orange-growers ship their fruit direct from the trees, without allowing it to go through a sweating or drying process. This is all wrong, and in a season when the fruit cures badly, owing to climatic influences, it occasions great losses. All fruit should be allowed time to evaporate the surplus of water secretions in the rind after picking, before packing for the market. In other words, it should be allowed ample time to sweat. By this process considerable shrinkage occurs. When packed direct from the tree the rigid, unyielding rind is easily abraded in handling and pressing into packages. When it comes to be generally understood that it is the oxygen of the air penetrating these little cracks or abrasions of the rind that cause decay, the sweating process will be more generally adopted in preparing all fruits for packing. Too much can scarcely be said upon this subject. The cells composing the skin or rind of fruit are constantly distended to their utmost while on the tree by a watery secretion, and hence are ruptured by the slightest contact, or at least by rough handling. This condition prevails until the fruit is past its prime ripe condition, when it will have lost its rigid texture, and these delicate cell membranes will have parted with most of their watery secretion. This natural curing process while yet on the tree results in a shrinkage of parts and consequently a collapse of the cell walls, which render them tough and elastic. The sweating after picking accomplishes the same that Nature does, as above indicated and described, but in a much more expeditious manner when the fruit is exposed to the atmosphere, as it should be in the curing-rooms. Fruit thus prepared offers almost absolute immunity against decay caused by careless handling. It is somewhat analogous to dried fruit; that is, the rind has been permitted to deplete itself of surplus moisture, by which the juice and pulp of the orange are nearly hermetically sealed up against atmospheric influences. Dried fruit never decays, however much it may be banged about, if kept in a dry and well-ventilated storage.—*Florida Fruit Farmer*.

LONG DISTANCE TRANSPORTATION OF SEEDS.

In a letter to the editor, Mr. J. C. Harvey, of San Juan Evangelista, Vera Cruz, Mexico, writes as follows:—

“By the way, I have just completed a most interesting experiment. As we all know, *Castilloa elastica* seeds quickly lose their vitality under ordinary circumstances, and the transmission of these seeds long distances, involving, say, as many as 45 to 70 days, has become a matter of some importance. Well, on 16th May of this year, I packed, in 6-oz. and 8-oz. tins, the fresh seeds dried and cured 5 days on mats in a shady place, in charcoal which was fairly well pulverised. To every pint measure of the pulverised charcoal was added one tablespoonful of water, mixing the charcoal thoroughly by shaking through a sieve. The seeds were then put into the tins little by little, adding charcoal and well tapping the tins so that the interstices between the seeds were thoroughly filled. No more, no less, than the charcoal was heaped up, so that the top of the can would have to be well pressed down, preventing any movement. The tins were sent to California to a friend to keep till 1st September, to be then returned to me. They arrived here 10th September. On opening the tins fully 75 per cent. appeared good. They were immediately sown, and to-day we have 60 per cent. of thrifty young seedlings 6 inches high.

“I believe at 60 days the percentage would have been 80 per cent. or 90 per cent. of seedlings. I also instructed a friend who lives in Toungoo, Burma, where they have some specially fine varieties of Jack fruit (*Artocarpus integrifolia*) how to ship me the seeds. He followed instructions, and I raised 80 per cent. of the seeds sent.”—*Agricultural Bulletin of the Straits and Federated Malay States*.

[If the above statement is correct, then it should be possible to import seeds of the mangosteen from India and Java into Queensland without loss of their germinating power.—Ed. *Q.A.J.*]

A NEW POMELO.—THE TANGELO HYBRID.

The *California Fruitgrower* announces a remarkable novelty in the results of the hybridisation of fruit. This latest novelty is called the Tangelo. The journal mentioned says:—

The bringing into existence of brand new fruits and vegetables is the principal work to be done in the Laboratory of Plant Breeding, just organised under the Department of Agriculture. Dr. Herbert Webber, who has been put in charge, has already succeeded in creating several distinct novelties in the vegetable kingdom while in collaboration with Walter T. Swingle.

A kid glove pomelo is a novelty just turned out by these gentlemen. Hitherto the pomelo has been a troublesome delicacy to handle, owing to the stubborn resistance of its pulp, which has refused to be quartered like the orange. Yet it has become “the” breakfast fruit of those who understand that it contains an alkaloid ingredient similar to quinine in tonic effect.

Dr. Webber and Mr. Swingle tried their luck at crossing the kid glove orange or tangerine with the pomelo. The tangerine obtains its most common name from the fact that when its loose, delicate skin is removed it falls into quarters naturally, and can be eaten with hands clad in the most delicate and immaculate of gloves. One of the hybrids resulting from this alliance has just given fruit, the offspring being about the size of an ordinary orange. It has the easily-removable skin and bright orange-yellow flesh of the tangerine, and its segments fall apart quite as readily as do those of the latter. It has the slightly modified bitter acid flavour of the pomelo, but not so bitter.

“Tangelo” is the name given to this new species. It was derived from the two words, “tangerine” and “pomelo,” which latter is the true name of the grape fruit.

The pomelo was used as the mother parent, the tangerine as the father. But the "tangelo"—the offspring of this odd experiment in plant matrimony—is neither a tangerine nor a pomelo. It is a distinct and new species, quite as distinct from either parent as is the lime or lemon.

A fortune should await the first grower who will learn to cultivate the tangelo on a large scale. It will thrive wherever the orange or pomelo will. Because of its greater convenience it will probably replace the pomelo to a large extent, although the latter is now largely in demand both for hospital and general use.

PAPAIN, OR PAPAW JUICE.

In the West Indies, especially in the island of Montserrat, the collection of papaw juice is a regular industry. The peasants collect the juice in calabashes, in which a small quantity of water has previously been placed, either from self-sown trees growing amongst the rocks on the mountain sides, or from trees planted around their dwellings. The juice is obtained by slightly scoring the rind of the fruit with a knife. As the juice falls into the water it thickens to the consistency of ice cream, and in this state is sold to the manufacturers at the rate of $\frac{3}{4}$ d. to 1d. per oz. In a letter to the *Agricultural News* of Barbados, Mr. Jordan, the Agricultural Instructor, says that there is a small plot of 120 trees under cultivation at the Grove Experiment Station, of these about 25 per cent. are males or non-fruited trees. The plot was planted in May, 1902, and has yielded to the end of December last, a period of about 7 months, over 10 lb. of juice. There are two varieties under cultivation, the long and the round fruited. With regard to the respective merits of these, our experience is that the long-fruited variety bears earlier and nearer the ground, both strong points in its favour. It is, however, claimed that the round variety gives the largest quantity of juice. This may be true, but as the latter grows to a considerable height the cost of collecting the juice is greatly increased in the case of old trees. He adds that one of the student gardeners at the station, where trees are plentiful, can collect on an average 4 oz. of juice per hour. The price of dried papain at the present time varies from 12s. to 16s. per lb.

We have on former occasions drawn attention to the value of papaw juice, and quoted the *Chemist and Druggist* as to the method of preparation of the juice for market. The papaw grows wild in the far north of this State, and the tree can be easily cultivated both on the coast and inland from Mackay northward. The collection of the juice is a simple matter, and could be done by the farmers' children.

ENORMOUS PIGS.

Particulars are given in the *Richmond Times*, Virginia, U.S.A., of two monster pigs grown by Mr. George T. Mapp, of Kellar, in that State. The bodies of these leviathans are respectively 7 feet 9 inches and 8 feet 2½ inches long, and girth 7 feet 4½ inches and 7 feet 3 inches. One is 6 feet 7 inches and the other 6 feet 8 inches tall. They are 35 months old, of the same litter, a cross of a "swamp rooter" with a Poland China, and their combined weight is said to be 3,000 lb. This exceeds the average weight of a pair of Clydesdale horses, and yet, strange to relate, these mastodons are said to be "active and get up to eat their meals three times a day."

[We have several times noticed accounts of abnormally large pigs killed in England. We take it for granted that the writers of these "facts" are in earnest, but we should much like to see even the photograph of a pig taller than a draught stallion.—Ed. *Q.A.J.*]

Horticulture.

PLANT BREEDING.

By JAMES PINK.

(Paper read before the Horticultural Society of Queensland, 15th April, 1903.)

Just 100 years have passed since Andrew Knight commenced to carry out his experiments in cross-fertilisation of plants, experiments which by their development were destined to work such great changes in every branch of the cultivated vegetable kingdom. No matter whether we look at the flowers that adorn and beautify our gardens, or at the improved varieties of fruits growing in our orchards, most of them have been so greatly improved and changed by cross-breeding as to be almost unrecognisable when compared with the original.

Knight's experiments were taken up and continued by Dean Herbert and Darwin, whose wonderful experiences and results carried the work on beyond the experimental stage.

The horticultural world realises to-day that the raising of new and improved flowers, fruits, and vegetables by cross-breeding and hybridisation forms the highest and noblest branch of practical horticulture.

With the exception of the great improvement in sugar-beet, no very striking commercial results have been obtained, but we have only just touched the fringe of plant-breeding—in fact, we are only standing on the threshold, looking down a long vista lined with probabilities and possibilities yet to be realised.

One need not be a prophet to read the handwriting on the wall that great and rapid changes are imminent in the vegetable kingdom. The world demands it. The population is rapidly increasing, and the products of the soil are in greater demand. To meet this demand new and improved varieties of our staple food-plants must be raised—varieties that will give greater returns per acre. Improved culture may do much, but that is limited; whereas the creation of new and improved varieties of our staple food plants by cross-breeding and by hybridisation is unlimited. Practice has swept away the scientific theory that all hybrids must be mules, a bugbear that has done much to retard progress in this direction. All scientific and practical agriculturists and horticulturists now realise that the desired improvement in our food-plants, fruits, and flowers can and must be brought about through the sexual organs of the plants.

Cross-breeding is a part of the general philosophy of Nature, revitalising the offspring, and making them stronger and more productive than their parents.

Crossing between stock of the same variety grown in different places or under different conditions gives better offspring than crossing between different plants grown under similar conditions.

Crossing within the variety with change of stock, within ordinary bounds, with careful selection, appears to give the best results, and will prove more successful than groping after new varieties. Upon this point Darwin expresses himself as follows:—

“It is a common practice with horticulturists to obtain seed from another place having a different soil, so as to avoid raising plants for a long succession of generations under the same conditions; but with all the species which freely intercross by the aid of insects or of the wind, it would be an incomparably better plan to obtain seed of the required variety which had been raised for

some generations under as different conditions as possible, and sow them in alternate rows with seed matured in the old garden. The two stocks would then intercross with a thorough blending of their organisation, and with no loss of purity to the variety. This would yield far more favourable results than the mere change of seed."

It was by the carrying of this principle into practice by Vilmorin and others that the great improvement in sugar-beet was brought about. The best roots were collected in different localities, planted together, and crossed each year, giving each year an increase of sugar of better quality. The past and future value of this work to the world is represented by vast sums of money. Professor Hays, of the Department of Agriculture, U.S.A., speaking at the conference in London, said:—"Sugar-beet breeding is the most prominent object lesson we have in breeding plants. The result should inspire the world with a faith that all useful plants may be scientifically bred, which would add greatly to the world's wealth."

The Department of Agriculture, U.S.A., reports having raised a number of improved varieties of wheat which will give an increased yield of from 5 to 10 per cent. These have been raised to suit various localities. All varieties of wheat will not thrive in the same district; it is therefore necessary to raise varieties suitable to the different districts.

This makes it advisable for every country to raise varieties of food plants and fruits suitable to its own peculiar conditions. The improvement of our varieties of wheat is so important that Australia should spare no efforts in raising varieties suitable to its various requirements and climatic conditions. Improvements of this kind can only be brought about gradually; the results are accumulative, the work of one year serving as a foundation for better results the next.

Maize is another of our staple plants that is capable of great improvement by careful selection and cross-breeding.

The Department of Agriculture, U.S.A., has raised a great number of hybrid oranges, mostly by crossing the common orange with *Citrus trifoliata*, the object being to obtain a hardy variety that will withstand their severe winters and produce a good marketable fruit. Experiments are also being made with a view to raising a variety that will resist disease. It is stated that a variety of the sour orange has been found by extended observation to be largely immune to the worst orange disease known in Florida. This variety has been crossed with others, hoping to produce an edible sweet orange free from disease.

Work of this kind has been attempted in our own State. The late Dr. Joseph Bancroft raised several hybrid grapes, crosses between the European and the American varieties. These hybrids were to have been crossed again with *Vitis riparia* and *Vitis rupestris*, which are Phylloxera proof, the object in view being to obtain good table and wine grapes that would be Phylloxera proof. The doctor expected it to take seven years to carry this work to a successful issue, but alas! he did not live to complete it. Life is too short for one man to succeed in work of such magnitude. An undertaking of so great importance to the State should be taken in hand by some society or institution, where the details and progress of the experiments would be recorded and the work continuous, not depending on the life of one man. One reason that the cross-breeding and hybridising of our tree fruits has not been more largely undertaken is, that the man who initiates the work is not likely to benefit by the result.

Our orchardists suffer great loss from the ravages of the fruit-fly. The fly appears to have come to stay, and the only remedy seems to be to raise varieties of fruits like the Wild Goose plum, that will resist it. The fly operates with fatal effects on the Japanese plums, the fruit of which are very fine and the trees great croppers, but it is seldom that a single fruit escapes the fly, so that many are grubbing out their trees. It would be of great service if

science would tell us what is the difference in the properties of the two plums—the Wild Goose, which the fly does not injure, and the Japanese, which it destroys. The remedy appears to be to raise a fly-proof plum by crossing the Wild Goose plum (*Prunus hortulana*) with the Japanese plum (*Prunus triflora*). By this means a better fruit than the parents should be obtained, and one more suitable to the country.

How far this principle can be carried remains to be proved, but a number of hybrids between the Wild Goose plum and the peach have already been raised. Like the cross between the black currant and the gooseberry—hybrids of which have been raised by three different men—what the result of the break will be cannot be foreseen.

Hybridising is the beginning of a new strain, the starting point from which new developments will result. From the hybrid seedlings the operator will select the plants that, in his opinion, are the nearest to perfection. Then by crossing these again by selection from their progeny and the progeny of succeeding generations he will gradually obtain the new variety that he desires. These cross-bred seedlings are the plastic material out of which new varieties of plants are made.

The pineapple, in certain districts, suffers greatly from a disease which has never been defined nor given a name. I have studied the so-called disease for twenty years, with this result: The pines in the districts affected are suffering from debility; the plants have been grown so long on the same soil that their constitution is weakened. I have proved this several times by planting plants from the affected districts in other good pineapple districts, where they have done well for a year or two, and then, under the first adverse circumstances, they began to go, by first turning yellow at the tips of the leaves and gradually getting worse, till they had to be dug out. These plants—speaking from a gardener's point of view—had no constitution. Plants from a different strain, when planted in the same place from which the diseased ones had been removed, grow well, and show no ill-effects. This, I think, is conclusive that the cause is in the plant, and the trouble has been brought about by the plants having been grown so long on the same soil, without proper manure, that the land was exhausted of the inorganic constituents necessary to supply the demands of the growing plant. The latter are consequently overtaken by decrepitude, the system becomes disorganised, and death ensues. The only remedy for this state of things is to raise cross-bred seedlings. The seedling, being a new plant born into the world through the sexual organs of the plants, is a new individual, possessing all the vigour and strength of youth; whereas a sucker taken from the old plant is a part of that plant, and will retain all the weaknesses of the parent from which it was taken, no matter where it may be planted.

To obtain good seed, two good healthy plants should be selected as the parents or seed-producers. When these plants are in flower—which must be watched to note when the organs are fit for crossing—have arrived at the proper stage, the pollen must be taken from the stamens of a flower of one plant and applied to the pistil of the flowers of the other plant, and *vice versa*, so that both parents can be made seed-bearers. The sexual organs of the pine do not mature at the same time, so that it is incapable of self-fertilisation. If the seed is sown as soon as obtained, the young plants will fruit in two years. The plants do not show to the best advantage at the first fruiting, but let them grow on for a year or two, giving them liberal treatment, and at the third year they will be at their best. Some will only be equal to their parents, a few better, but all will be strong and vigorous.

I have grown and fruited about 300 seedling pines this season. These pines were the property of the Acclimatisation Society, but they, having no available space for fruiting them, passed them on to me. I am also raising more seedlings from plants that I carefully crossed.

Plants may also be bred to suit local conditions. Some of the tree fruits that thrive well on the Downs will not do so in the coastal districts, notably the apple.

The late Mr. A. J. Hockings raised several cross-bred apples and peaches, some of which have stood the test of twenty years. Here is the foundation from which other varieties can be raised suitable to our requirements by careful cross-breeding. The names of the apples raised by Mr. Hockings are "Canvade" and "The Greening"—two excellent apples. There are also two introduced apples that do better on the coast than most kinds; they are Lord Nelson and the Duchess of Oldenburg. The latter is of Russian origin, and has proved an excellent parent in America. The Duchess should be crossed with Canvade, and Lord Nelson with The Greening. This cross would throw a progeny some of which would be suitable for growing anywhere below the Range.

It is a standing disgrace to the horticultural world of Queensland that nothing has been done to improve our native fruits. Doubtless the Australian orange and lime, if brought under cultivation and crossed, could be made to produce new varieties that would prove invaluable to the orchardist.

I have so far considered it unnecessary to offer a description of the manual part of crossing the flowers, it being so very simple and well known. It consists merely—after the plants to breed from have been selected—in conveying the pollen from the anthers of one plant to the stigmas on the other plant at the proper time, and then to protect the flowers from outside influence. Hybridising is only the beginning of plant-breeding. The young hybrid plants are generally very weak when first raised, but when the break between the two species has been obtained, then the work can proceed by crossing the hybrids with other desirable varieties, with the result that strong and healthy seedlings will be obtained, and the future progeny can be moulded to anything within the species.

The cross-breeding of plants is just as easy and as certain to produce what is required as the crossing of fowls in the poultry-yard, or of sheep on a station, providing the very best of their several kinds are selected as the parents.

Hybridising is the beginning of the raising of new and improved varieties of plants, cross-breeding and selection is the end, and this embraces all the means necessary for man to regenerate and improve the vegetable kingdom to supply his wants.

I would suggest that every member of this Society who is interested in this work should take up one variety of plants to operate on, according to his taste and opportunity, and report the results from time to time as occasion may require, and that at the end of twelve months we hold a meeting for the purpose, and all report progress. By this means a beginning would be made in this important branch of horticulture.

On my own part, I may say that during the past year I have been working on the pineapple, the strawberry, and the grape, of all of which I have seedlings from which I may reasonably expect good results, and I intend to continue on the same lines during the present year.

I am not so vain as to think that I know more about plant-breeding than some of my fellows, but I would willingly give instructions to any beginner at the work, so far as my time will allow.

THE SWEET POTATO WEEVIL.

This pest, which attacks the sweet potato, and in some cases destroys a whole crop, has been successfully defeated by Mr. S. C. Voller, Assistant Instructor in Fruit Culture. Being much troubled by the weevil, he tried many remedies without avail. At last he tried sulphur, scattering it by handfuls on the crowns of the plants. The result was that in three seasons the weevil entirely disappeared from his land. He does not positively assert that this was the effect of the sulphur, but the probabilities are very much in favour of such an assumption, from the fact that other people who used no sulphur still are troubled by the pest.

Tropical Industries.

TRASHING CANES.

Much has been talked and written about the value or uselessness of trashing—that is, removing the dead leaves from the sugar-cane. The practice, although it has been abandoned in some sugar-growing countries, has much to recommend it. Indeed, in North Queensland, where there is an excessive rainfall, it would seem to be an absolute necessity. We have before pointed out the advantages derived from trashing. These are—admission of sun and air to ripen the cane; doing away with a harbour for destructive insects and rodents; preventing the eyes of the cane from shooting by removing the receptacles for their roots in the shape of moist soil deposited at the junction of the leaves with the cane, by dust and rain; rendering the cane easier to cut; avoiding the cartage of large masses of useless matter, which is better left on the field, and minimising the risk from fire. Notwithstanding these obvious advantageous results of trashing, there are some planters who question whether the expense of carrying out the work is compensated by them.

On the Upper Russell River, in North Queensland, there fell in March, 60 inches of rain. In 60 hours 30 inches fell, of which 20 inches fell in the first 30 hours. One would think that in any cane-growing country such a rainfall would necessitate trashing.

YAMS.

The cultivation of yams is generally considered by people who have not visited Queensland to be strictly confined to tropical countries. That this is not so is shown by the fact that the yam thrives well and attains a large size everywhere on the Queensland coast. At the penal establishment at St. Helena, in Moreton Bay, excellent yams are produced. They are also grown in many gardens in the neighbourhood of Brisbane and other coast towns. As a marketable product the yam does not seem to come into favour, and cannot compete with the sweet potato. This may be owing to its glutinous nature, which few in this State appreciate. Nevertheless, it is an excellent vegetable, and one which will thrive under conditions where the sweet potato would not do so. As an instance, we know of a garden, near Brisbane, where several yams are growing luxuriantly under irrigation. In the yard outside the garden, which is very gravelly, another yam has thriven all through the dry spring and summer, and it never received a drop of water until the first rains came; yet there is no perceptible difference between those which were carefully cultivated and that which was left severely alone. All have masses of leaves and runners.

Yams do not belong to a species which is divided into varieties, but they are different species of a family, scientifically known as *Dioscorea*, and hence are reckoned amongst the *Dioscoreaceæ*. They are mostly indigenous to the East and West Indies. Some have poisonous bulbs. Such are:—*Dioscorea virosa*, *Tripholla*, and *Dæmonum*. This poisonous property may be detected by the abominable smell they give off when being cooked. The useful varieties have not yet been absolutely determined, but we give the names of a few of the best known edible kinds: *D. bulbifera*, *D. aculeata* (prickly yam), *D. globosa*, the most highly-prized kind in India; *D. rubella*, whose bulbs attain a length of 3 feet. The winged yam (*D. alata*) is the most productive. There are several other varieties which have been introduced from the South Sea Islands, but they are practically only grown as curiosities, the yam being out of favour in this State, and undoubtedly very much overrated by travellers.

The yam requires a warm, damp climate to be produced to perfection. They are propagated by setts from the roots, or by small bulbs, which are planted in the same manner as seed potatoes. Some people run the vines along a garden fence, or over verandas and roofs, where they certainly act as a shelter from the hot sun, and form no ungraceful shade. They require much the same soil as the sweet potato, and the ground is prepared for them in the same manner. The roots penetrate perpendicularly into the ground, often to a great depth. If they encounter no obstacle, such as a hard subsoil, they grow very long and comparatively thin, or else they thicken out at the bottom in such a way as to render it a matter of difficulty to dig them out whole. In order to induce a proper growth, they are usually planted in shallow soil, or if such is not procurable, then a flat stone or board is set at some depth below the sett. After planting, a stout stake is set near the hole. When the shoots appear, they run very rapidly, and climb up the pole. The after cultivation consists, as usual, in weeding and loosening the soil. The cultivator can be run between the rows, and with a Dutch hoe the weeds can be destroyed close up to the plant. Yams may be kept in the same manner as sweet potatoes for a long time in pits, in alternate layers of sand and yams.

IRRIGATION AT BURRABOGIE (N.S.W. WESTERN DIVISION).

Many landholders in the country embraced by the proposed Murrumbidgee and Murray River irrigation schemes have arrived at the conclusion that only a comprehensive distribution of the waters, which now run uselessly to the sea, can render these districts permanently profitable. While the Government has been talking of large schemes and frittering away money on peddling little works, some of the pastoralists have been putting irrigation to the test. A typical example is that at Burrabogie Station, on the Murrumbidgee. Here Mr. R. Hill, the manager, is growing sorghum with the aid of irrigation, and the results of the enterprise are very striking. The plant for raising the water consists of a steam 30-horse power engine and a 15-inch discharge centrifugal pump, which throws 4,000 gallons per minute into the channel. This source of supply is sufficient to thoroughly irrigate 100 acres of sorghum. Mr. Hill has the land ploughed, and sows broadcast 15 lb. of seed to the acre. The land being thoroughly irrigated every 3 weeks, the first crop matures for green fodder in from 8 to 10 weeks, and yields about 30 tons to the acre. Three crops are cut from one seeding, and the fodder from the 100 acres feeds 5,000 sheep. Mr. Hill states that a very much larger number of sheep could be kept going, and he is convinced that the area would feed 50,000 sheep during 3 months of the most favourable part of the year. The crops are of wonderfully luxuriant growth, and some stalks have measured 10 feet 4 inches in length. After the first flooding, the 100 acres are covered by the engine running 4 days and 3 nights without ceasing. The whole cost of working the farm is £12 per week, and Mr. Hill considers that immense advantages could have been gained had more extensive operations been begun during the earlier stages of the drought. The irrigated area is well laid out, and provided with a good channel system. The water is raised 40 feet from the bed of the Murrumbidgee into a channel half-a-chain in width. From this flood gates are worked for distributing the water over the land. The banks of the channel are cut at the highest levels in the usual way, and the water is very thoroughly applied to the soil. Finding that the sheep being fed cannot consume the sorghum, Mr. Hill is now making ensilage, and large quantities of fodder are being carted to the silo.—*Pastoralists' Review*.

Vegetable Pathology.

NOTES ON AN APPARENTLY NEW HYBRID GRAPE.

By THOS. L. BANCROFT, M.B., Burpengary.

I have noticed that in South-eastern Queensland out of a large number of species and varieties of the grape vine two kinds grow remarkably better than the others. These two are the Isabella, a variety of *Vitis Labrusca* (Linné) and Lenoir, which has been derived from *Vitis æstivalis* (Michaux), both of North American origin. The Isabella and Lenoir, although subject slightly to the attack of the various fungoid diseases, are injured scarcely at all by them; some other varieties of the American group, too, do fairly well, whereas the varieties of *V. vinifera* (C. Bauhin) thrive but poorly, and are attacked very seriously indeed by fungoid pests, even when means are taken to keep these diseases in check. So miserably do the European grapes succeed on the coast country that from a commercial point they are not worth growing.

The Isabella, together with the other American grapes, lack the exquisite flavour of the *Vinifera* varieties, and it occurred to me in 1896 that better-flavoured varieties, more suitable to the climate, might result from cross-fertilisation, using the Isabella as the seed parent and some good-flavoured variety of *V. vinifera* as pollen parent.

For several years I succeeded in raising each season one or more seedlings, supposed hybrids, between Isabella and White Portugal. The first of these, a vigorous vine about six years old, has fruited, and turned out to be a hybrid. Fortunately it has acquired the vigour of the Isabella, and resists the attack of fungoid pests. It is a white grape, bearing large bunches of good-sized grapes; with a distinct flavour decidedly better than Isabella. It ripens its fruit earlier than either parent.

It is quite possible that this variety has been produced before. Baron von Müller, in his "Select Extra-tropical Plants," p. 439, remarks:—"Many good and fertile crosses between *V. Labrusca* and *V. vinifera* occur in North American cultivation; the Delaware grape is a hybrid from *V. Labrusca*, according to Bush and Meissner, and has in its turn given rise to many other good crosses."

My grape is distinct from a very fair white hybrid raised by my father, the late Dr. Joseph Bancroft. Unfortunately the parentage of his hybrids is not known.

In attempting to make new varieties of the grape by cross-fertilisation, the method to be recommended is as follows:—Of the seed parent select a good flower spike with buds on the point of bursting; with a minute pair of scissors snip off all the buds except six or seven distributed over the spike, and in convenient places for manipulation. Then with a small penknife blade make very sharp cut through the petals at their base, carefully avoiding any injury to the ovary. Should, however, the ovary be scored, snip off that bud, and start upon a fresh one. When the petals have been removed successfully from a bud, examine the anthers with a magnifying glass; should they have burst, discard that flower. Provided the anthers have not burst, snip off all the stamens. Proceed in this way until three buds have had their petals and stamens removed; three are quite sufficient for an experiment. After this, snip off any unoperated-upon buds. To make quite certain that the stigmas of the three flowers operated upon do not already contain some pollen grains, stroke them several times with a camel-hair brush wetted in water; by so doing, any pollen that might be there would be removed, for it is very unlikely

that such pollen would have been there long enough to have emitted pollen tubes. Now apply the pollen of the male or pollen parent; afterwards tie a piece of fine muslin round the spike, and attach a label to the stem. Should you afterwards succeed in raising a single plant from your exertions, carefully nurse it, for in all probability it will prove to be a hybrid. In the old-fashioned way of dusting pollen on to a spike of flowers that had naturally burst open, one required to treat large numbers of flowers and raise thousands of seedlings. After attending to so many seedlings for from three to ten years—that is, until they fruited—perhaps not one of them would turn out to be a hybrid, or even a variety; still there is always a chance, and in the past most of the varieties now in existence have been so obtained. In some varieties—e.g., White Portugal—the anthers burst before the petals are shed; it is not prudent to use such a variety as the seed parent.

It is very important to keep notes of what you have done, and label all your seedlings.

If this had been properly done in the past, much trouble would have been saved future hybridists.

My thanks are due to Messrs. F. M. Bailey, E. H. Rainford, and James Mitchell for information on the nomenclature of grapes.

Referring to the above notes on a new hybrid grape, Mr. E. H. Rainford, Instructor in Viticulture, writes:—"I cannot too warmly recommend to experimenters in hybridisation the excellent advice of Dr. Bancroft as regards the care that should be observed to obviate all possibility of undesirable pollen falling upon the stigmas. The common idea that it is sufficient to rub together two varieties of flower bunches to produce a hybrid is very erroneous. I must, however, dissent from two remarks of Dr. Bancroft—one, that the Lenoir is practically free from disease, as this vine is very subject to anthracnose; and the other, that the *Vinifera* do miserably on the coast. Some do, no doubt, but with very reasonable care the Chasselas, Black Hamburg, and Mrs. Pince Muscat can be grown quite free from disease on the coast as far north as Rockhampton."

PIGNON D'INDE.

Referring to a notice on the Cuban Piñon, in our last issue, Mr. W. Sheldon, of the Stock Department, who was long resident in the West Indies, writes:—

Under the head of "Forestry," in the May number of the *Queensland Agricultural Journal*, you mention a plant as being used for fencing in Cuba, called piñon (pineapple seed) or pignon.

In Jamaica, a sort of pineapple or aloe, called by the creole "penguin" (the *patois* can be understood), is used occasionally for fencing. It has a strong spine at the point of the leaf, and the sides are serrated and prickly. As a fence, it is pig-proof if thickly planted, but spreads and takes up too much room. The fruit, or seed, in the centre is used by the natives at a push for soap, and I have seen the penman (or stockman) use the fibre as a cracker for his whip, and the boys for whipping on fish hooks. When clearing the pastures of it, it is carted into the pens (yards), and chopped up for manure making, and as it is succulent, it causes the megass (bagasse) to decay.

Its usefulness is, however, questionable. Being pig-proof, if planted closely, it might form a barrier to the advance of rabbits, and having no branches, the sparrows could not multiply in its shadows. It would also compete with the Bathurst burr and prickly pear for the possession of waste or any other land, and flourishes in dry places.

Robinson Crusoe, whom you mention, may possibly have fenced himself in with an acacia, which is indigenous to the lands where the penguin is at home, and its thorns would speak for themselves.

Animal Pathology.

SWINE FEVER.—SYMPTOMS AND TREATMENT.

[Reprinted from the *Brisbane Courier* of 14th May, 1903.]

By WILMOT C. QUINNELL, M.R.C.V.S., Lon.

In view of the recent outbreak of swine fever in the vicinity of Brisbane, we have obtained, from the Chief Inspector of Stock, the following important article on the disease and its means of eradication, prepared by Mr. Quinnell (veterinary surgeon to the Department) at Mr. Gordon's request:—

Definition.—Swine fever may be described as a specific contagious fever, affecting the pig, almost constantly associated with an inflammatory and ulcerative condition of the alimentary tract, less constantly of any other organs, glands, or skin. The disease is caused by a specific micro-organism called the bacillus of swine fever; it is peculiar to swine, and does not affect other animals of the farm. The disease is purely a contagious one, and when an outbreak occurs its origin can always be traced to infection being carried from an area where there has been an antecedent outbreak. Contagion may be conveyed by removal of pigs or their excreta from infected areas to uninfected localities, or any animate or inanimate object freshly contaminated by excreta from swine fever stricken pigs.

Symptoms.—Symptoms are by no means constant, and many of those signs popularly regarded as characteristic of swine fever are frequently observed as symptoms of many other diseases or disorders of pigs. Moreover, in the least virulent form the outward indications of disturbed health may be so slight that an affected pig may readily pass for healthy. When a number of pigs have been exposed to the contagion of swine fever the majority of them begin to show signs of illness in from 10 to 20 days. In the more pronounced forms of swine fever the symptoms that are shown by the sick animal will not be very definite until the affection is fairly advanced. Dulness, diminished appetite, hot skin, occasional shivering fits, the back arched, the flanks drawn in—are amongst the first signs of infection. Diarrhœa may occur early in the disease after a short period of constipation, and the evacuations are generally light in colour at first, having a most objectionable odour, becoming darker by-and-by, and in severe cases the discharge consists almost of mucus and blood. Red patches or blotches appear behind the ears, inside the arms, under the belly, and inside the thighs, more apparent in light-skinned animals. Discharge of thin fluid from the eyes and nose commonly takes place early in the course of the disease, and as it advances the discharge becomes thick, purulent, sticking about the eyelids and openings of the nostrils. This is the course of the disease, and as it advances the discharge becomes thick, degree directly to the intensity of the affection of the respiratory apparatus. Sometimes there are signs of partial paralysis, and the pig moves in an unsteady manner from side to side, frequently losing the use of one or both hindquarters, and dropping to one side, or dragging both hind legs as it attempts to move forward. Death may take place at various periods from the commencement of visible signs of the affection, sometimes after a few days' illness, while in other cases the animal may linger two or three weeks. Sudden changes in the weather, particularly from warm to cold, appear to increase the fatality of this disease. The mortalities in herds where the ravages of the disease are unchecked average 70 per cent., or even higher. Moreover, the fact must not be lost sight of that animals that have passed through and recovered from a slight attack of the disease are a constant source of infection for several months subsequent to recovery.

SUMMARY OF POST-MORTEM APPEARANCES.

Some of the changes that are effected in the organs of the body by the ravages of swine fever can only be appreciated by the pathologist; others—especially those more characteristic of the chronic condition—are patent to the ordinary intelligent observer. The principal lesions are:—

(a) *Acute Form.*—Stomach: The mucous membrane or inner lining is deeply reddened. Small Intestines: The mucous membrane is reddened in patches or uniformly throughout its entire length. Large Intestines: The mucous membrane is generally of a uniform dark-red appearance right through its length. Blood extravasations (exudations or secretions) are observed in the lungs, heart, kidneys, and lymphatic glands. Spleen: Is enlarged and soft.

(b) *Chronic Form.*—Characteristic lesions in this form are found chiefly in the large intestines, especially at the base of the valve formed by the entrance of the small intestine into the cæcum (blind gut). These lesions take the form of rounded areas of dead tissue (necrotic), leathery in consistency, raised above the level of the surrounding mucous membrane of the gut, varying in size from that of a split pea to a shilling, though by a confluence of a number of these lesions the necrotic areas may become as large as a five-shilling piece. In colour they vary from a yellow to a blackish brown. Necrotic areas may also be found in the liver, spleen, lymphatic glands, or lungs, associated with consolidation of that organ resulting from inflammation.

MEANS OF ERADICATION.

One of the greatest living authorities on the contagious diseases of animals, Sir George Brown, F.R.C.V.S., late veterinary adviser to the Board of Agriculture, England, has made himself responsible for the statement that “nothing short of cattle plague measures—that is to say, the prompt slaughter of both diseased and apparently healthy pigs on all premises on which the disease has been detected, and the equally prompt imposition of restrictions on the movement of pigs in infected areas—will suffice to eradicate swine fever from England.” In this opinion he received the support of Professor McFaydean, M.B., C.M., B.Sc., F.R.S.E., M.R.C.V.S., who states that “it is impossible to deny that this opinion receives the strongest support from the inefficiency of the half-measures which have been employed since 1878, when swine fever was added to the list of contagious diseases within the meaning of the Contagious Diseases (Animals) Act.”

The year 1896 marked an important new departure in the system of dealing with the disease in Great Britain. In April of that year the Board of Agriculture issued the Swine Fever Infected Areas Order, which made it illegal to move any pig within the prescribed area unless it appeared to be healthy, and had been on the premises for 28 days, and during that period had not been exposed to the contagion of swine fever. In August of the same year, this was followed by the Swine Fever Suspected Zones Order, which imposed less stringent regulations with regard to movement in localities in which it was believed that unreported cases of the disease had frequently occurred. Within a few months after the issue of these orders the weekly returns of outbreaks began to show declining numbers, and decline continued until, as indicated by the published reports, the disease became only half as prevalent as it had been in 1894 and 1895.

When put into force, the working of these Acts produced such excellent results in diminishing the number of outbreaks that it was predicted by competent authorities that the eradication of the disease was a question of the near future, but, unfortunately by a premature relaxation of these restrictions, the disease showed a recrudescence in 1898.

Statistics.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

TABLE SHOWING THE TOTAL RAINFALL FOR EACH MONTH OF THE YEAR IN THE AGRICULTURAL DISTRICTS OF QUEENSLAND.

STATIONS.	1902.									1903.			
	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April.
<i>North.</i>													
Bowen ...	0.68	Nil.	0.44	0.11	0.02	Nil.	0.06	0.06	3.16	1.66	7.65	16.44	1.44.
Cairns ...	3.48	2.34	4.97	3.87	0.95	Nil.	0.16	1.38	5.15	21.32	10.28	32.51	15.50
Geraldton ...	12.83	5.39	8.10	7.32	1.77	Nil.	0.29	0.44	5.63	38.94	17.24	45.00	14.03.
Herberton ...	1.54	1.07	1.58	2.05	0.03	Nil.	0.93	1.13	7.02	6.68	3.69	20.80	12.04.
Hughenden ...	*	Nil.	Nil.	Nil.	Nil.	Nil.	0.05	0.22	2.77	1.52	0.99	0.95	0.81.
Kamerunga ...	3.40	2.63	5.12	4.00	0.81	Nil.	0.29	1.57	3.79	20.36	10.82	37.45	19.32
Longreach ...	0.03	0.03	Nil.	Nil.	0.05	Nil.	Nil.	1.27	1.56	1.81	0.09	3.48	Nil.
Lucinda ...	1.78	*	0.63	0.21	0.45	Nil.	0.22	0.10	2.47	17.43	11.66	44.24	6.44.
Mackay ...	6.73	1.26	2.33	0.59	0.80	Nil.	0.17	0.35	7.71	10.45	6.47	13.51	1.50
Rockhampton ...	0.21	Nil.	Nil.	Nil.	0.09	1.41	0.05	0.51	5.60	0.92	1.68	3.73	1.12
Townsville ...	0.35	0.04	0.10	Nil.	0.10	Nil.	0.29	0.08	6.50	4.66	8.11	19.80	1.61
<i>South.</i>													
Barcardine ...	0.02	Nil.	Nil.	Nil.	0.03	0.02	0.21	0.95	6.41	3.73	0.40	0.94	Nil.
Beenleigh ...	0.42	Nil.	0.11	0.62	0.49	0.28	2.92	3.36	1.83	1.88	4.77	6.49	1.90.
Biggenden ...	0.65	Nil.	0.04	0.08	0.04	1.58	2.34	0.25	8.98	2.25	3.15	3.95	0.16.
Blackall ...	0.05	Nil.	0.01	0.01	0.21	0.27	0.12	1.05	4.61	3.04	1.50	3.87	Nil.
Brisbane ...	0.17	0.47	0.06	0.55	0.98	1.30	3.42	2.59	1.82	1.31	5.35	4.79	1.33
Bundaberg ...	0.43	0.02	Nil.	0.07	0.13	0.31	1.24	0.63	1.38	0.97	2.60	6.05	0.38
Caboolture ...	1.99	Nil.	0.03	0.20	0.05	1.09	2.30	3.17	1.74	5.15	3.42	9.59	1.39.
Charleville ...	0.23	Nil.	0.12	Nil.	1.04	0.30	1.05	2.14	4.79	1.70	0.43	2.94	1.06
Dalby ...	2.00	Nil.	0.15	Nil.	0.41	0.70	3.14	2.79	3.20	1.28	1.22	4.89	1.33
Emerald ...	0.30	Nil.	0.01	Nil.	Nil.	0.02	0.01	1.58	8.42	2.30	2.49	1.48	0.26.
Esk ...	1.25	Nil.	0.04	0.25	0.15	0.64	0.93	4.00	7.67	1.32	3.51	4.46	1.25.
Gatton College ...	*	0.04	0.03	0.04	0.64	0.73	2.41	3.72	5.14	3.68	3.81	2.60	0.79
Gayndah ...	0.81	0.29	Nil.	Nil.	0.05	0.64	2.10	2.08	3.37	0.77	2.08	2.30	0.09.
Gindie ...	0.47	Nil.	Nil.	Nil.	Nil.	0.10	Nil.	1.65	7.14	1.43	3.15	0.49	0.19.
Goondiwindi ...	0.06	0.02	0.41	Nil.	1.19	0.21	1.50	0.69	2.21	1.84	0.72	4.40	1.73.
Gympie ...	1.09	0.23	Nil.	0.36	0.94	1.38	3.80	1.40	4.32	2.40	3.27	5.06	1.28.
Ipswich ...	0.03	0.02	0.15	0.31	0.77	0.30	2.86	3.45	1.84	1.36	5.55	3.79	2.24.
Laidley ...	0.10	0.20	0.06	Nil.	0.40	0.89	2.21	3.27	5.13	0.71	3.63	2.63	0.95.
Maryborough ...	1.57	0.36	0.24	0.29	0.57	0.69	0.91	1.11	4.02	2.09	2.76	3.23	0.66.
Nambour ...	†	0.26	0.04	*	0.70	0.35	1.26	1.66	2.64	2.53	5.03	5.18	0.83.
Nerang ...	0.65	0.35	0.52	1.07	1.22	1.17	3.15	1.75	1.73	3.36	4.73	4.84	3.04.
Roma ...	0.15	Nil.	0.20	Nil.	0.46	0.35	0.92	0.86	2.35	0.75	0.15	2.48	0.39.
Stanthorpe ...	0.10	0.87	0.78	0.15	0.94	0.95	2.29	3.98	1.75	0.23	1.59	0.95	1.18.
Tambo ...	0.04	Nil.	0.01	Nil.	0.28	0.06	0.41	1.34	4.14	2.43	0.15	4.73	0.02.
Taroona ...	0.33	Nil.	Nil.	Nil.	0.17	0.45	0.68	1.40	2.88	4.32	1.53	1.29	0.82.
Tewantin ...	2.84	0.80	0.91	0.91	0.85	0.87	1.94	1.96	1.35	1.90	5.30	11.52	1.80.
Texas ...	Nil.	Nil.	0.88	Nil.	1.57	0.13	2.42	1.67	1.42	0.18	0.94	0.48	1.84.
Toowoomba ...	0.79	0.03	0.33	0.19	0.56	0.37	3.07	3.18	6.99	2.21	3.42	3.60	1.27.
Warwick ...	Nil.	0.15	0.63	0.20	0.94	0.43	2.96	2.87	4.61	0.68	2.59	2.13	0.73.
Westbrook ...	0.41	Nil.	0.28	0.06	0.29	0.38	3.20	3.34	3.37	4.21	2.70	1.52	0.34.

CLEMENT L. WRAGGE,

Wragge's Weather Bureau.

PRICES IN BRITISH MARKETS OF ARTICLES WHICH CAN BE PRODUCED IN QUEENSLAND.

BUTTER.—New Zealand, choicest, 106s. to 108s., finest, 102s. to 104s. Danish, choicest, 119s. to 121s., finest, 116s. to 118s.; Canadian, finest, 86s. to 98s.; Australian (Victorian), choicest, 108s. to 110s., finest, 86s. to 100s. per cwt.

CHEESE (duty free).—Canadian, 70s.; New Zealand, choicest, 68s. to 69s., finest, 66s. to 67s. per cwt.

CONDENSED MILK.—18s. 6d. to 20s. 6d. per case in 20-case lots.

SUGAR (duties, raw, 2s. to 3s. 10d. per cwt.), &c.—Refined, £15 6s. 8d. to £16 6s. 8d.; raw, £10 to £15 6s. 8d. per ton; German beet, 88 per cent., 8s. 3d. per cwt.

MOLASSES (duty, 2s. per cwt. and $\frac{1}{4}$ per cent.).—7s. to 8s. per cwt.

RICE (duty, 5d. per cwt.).—Rangoon, £8 to £15; Japan, £13 10s. to £16 10s.; Java, £18 to £25; Patna, £14 to £22 per ton.

COFFEE (in bond, duty, 1½d. per lb. and $\frac{1}{4}$ per cent.).—Ceylon Plantation, 106s. to 120s.; Peaberry, 60s. to 123s.; Santos, 26s. to 52s.; Mocha, 50s. to 100s.; Jamaica, 100s. to 130s. per cwt.

CHICORY ROOT, dried (duty paid).—£26 to £31 per cwt.; manufactured, £33 to £35 per cwt.

ARROWROOT (duty, 5d. per cwt.).—Bermuda, 1s. 3d. to 1s. 6d.; St. Vincent, 1½d. to 4d.; Natal, 6d. to 7d. per lb.

WHEAT.—Manitoba, 33s. 3d. to 33s. 6d. per 406 lb.

FLOUR.—21s. to 30s. 6d. per 280 lb.

MALTING BARLEY.—28s. to 29s. 6d. per 448 lb.

OATS.—New Zealand, 26s. to 28s. to 31s. per 384 lb.

SPLIT PEAS.—45s. per 504 lb.

GINGER.—Japan, 28s. to 30s.; Jamaica, 48s. to 52s. per cwt.

PEPPER.—Black, 5¾d. to 6¼d.; white, 8¾d. to 11½d. per lb.; Capsicums, 16s. to 80s.; Chillies, 30s. to 35s. per cwt.

WINES.—Australian Burgundy, red, 18s. per dozen; quart flagons, 17s. to 23s. per dozen.

GREEN FRUIT.—Oranges, 7s. to 8s. 6d. for common, to 22s. and 31s. for finest selected, per case; lemons, 14s. to 24s. per case; bananas, 9s. to 12s. per bunch; apples, Tasmanian, 7s. to 12s. 3d.; Australian, 8s. to 13s.; Californian, 12s. to 14s.; New Yorks, 14s. to 17s. per case; Tasmanian pears, 4s. 3d. to 8s. per tray; grapes, 16s. to 18s. to 30s. per barrel; pineapples, 2s. 6d. to 5s. each.

DATES.—Tafilat, 55s. to 60s. per cwt.; Persian, 9s. 6d. to 14s. per case; Egyptian, 20s. to 35s. per case.

COTTON.—Uplands, 6d. (rising); Sea Island, 9d. to 1s. 2d. per lb.

COTTON SEED.—£4 10s. per ton.

COTTON SEED OILCAKE.—£6 15s. to £6 17s. 6d. per ton.

COTTON SEED OIL (crude).—20s. 9d. per cwt.

LINSEED.—41s. to 48s. per 416 lb.

LINSEED OIL CAKE.—£7 10s. to £7 17s. 6d. per ton.

LINSEED OIL.—£23 10s. to £24 15s. per cwt.

OLIVE OIL.—£30 to £60 to £70 per tun (252 gallons).

MANILA HEMP.—£34 to £36 per ton.

NEW ZEALAND HEMP.—£31 per ton.

SISAL HEMP.—£35 per ton.

FLAX.—£46 to £52 per ton.

FROZEN MEAT.—The following are the Frozen Meat Trade Association's Smithfield market quotations for the undermentioned classes of frozen meat, based on actual sales of not less than 100 carcasses of mutton or lamb, or 25

quarters of beef of fair average quality. These quotations are not for selected lines, but for parcels fairly representative of the bulk of the shipments now on the market:—

New Zealand Sheep.

(Crossbred Wethers and Maiden Ewes.)

	May 9.	May 16.
Canterbury, light (48 lb. to 56 lb.)	4 $\frac{1}{8}$ d.	3 $\frac{1}{16}$ d.
Canterbury, medium (56 lb. to 64 lb.)	4d.	3 $\frac{7}{8}$ d.
Canterbury, heavy (64 lb. to 72 lb.)	3 $\frac{3}{4}$ d.	3 $\frac{1}{16}$ d.
Dunedin and Southland (56 lb. to 64 lb.)	3 $\frac{1}{16}$ d.	3 $\frac{3}{4}$ d.
North Island (55 lb. to 65 lb.) ...	3 $\frac{1}{16}$ d.	3 $\frac{5}{8}$ d.

Australian Sheep.

(Crossbred and Merino Wethers.)

Heavy (over 50 lb.)	3 $\frac{7}{16}$ d.	None offering.
Light (under 50 lb.)	3 $\frac{7}{16}$ d.	None offering.

River Plate Sheep.

(Crossbred and Merino Wethers.)

Heavy (over 50 lb.)	3 $\frac{1}{16}$ d.	3 $\frac{1}{16}$ d.
Light (under 50 lb.)	3 $\frac{9}{16}$ d.	3 $\frac{9}{16}$ d.

New Zealand Lambs.

Canterbury, light (28 lb. to 36 lb.)	4 $\frac{3}{8}$ d.	4 $\frac{1}{16}$ d.
Canterbury, heavy (36 lb. to 42 lb.)	4 $\frac{1}{4}$ d.	4 $\frac{9}{16}$ d.
Dunedin and Southland (28 lb. to 42 lb.)	4 $\frac{5}{8}$ d.	4 $\frac{1}{2}$ d.
North Island (28 lb. to 42 lb.) new season's	4 $\frac{1}{2}$ d.	4 $\frac{3}{8}$ d.

Australian Lambs.

30 lb. to 40 lb.	4 $\frac{1}{4}$ d.	4 $\frac{1}{8}$ d.
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River Plate Lambs.

30 lb. to 40 lb.	4 $\frac{1}{4}$ d.	4 $\frac{1}{8}$ d.
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New Zealand Frozen Beef.

Ox, fores (180 lb. to 220 lb.) ...	3 $\frac{1}{2}$ d.	3 $\frac{3}{8}$ d.
Ox, hinds (180 lb. to 220 lb.) ...	4 $\frac{1}{4}$ d.	4 $\frac{3}{8}$ d.

Australian Frozen Beef.

Ox, fores (160 lb. to 200 lb.) ...	None offering.
Ox, hinds (160 lb. to 200 lb.) ...	None offering.

River Plate Frozen Beef.

Ox, fores (160 lb. to 220 lb.) ...	3 $\frac{1}{2}$ d.	3 $\frac{3}{8}$ d.
Ox, hinds (160 lb. to 220 lb.) ...	4 $\frac{1}{4}$ d.	4 $\frac{1}{4}$ d.

(All quotations for beef are nominal.)

EGGS.—French, 7s. 6d. to 9s. 6d.; Danish, 6s. 3d. to 8s. 3d. per 120.

BACON.—Irish, 58s. to 61s.; American, 52s. to 56s.; Canadian, 58s. to 59s. per cwt.

HAMS.—Irish, 70s. to 96s.; American, 53s. to 57s. per cwt.

TALLOW.—Beef, fine, £35 5s., medium, £31; mutton, fine, £34 10s., medium, £31 10s. per ton.

COPRA (cocoanut kernel).—£15 15s. to £16 10s. per ton; £8 to £9 per ton at the South Sea Island trading stations. Corresponding value in Queensland, £10 to £12 per ton.

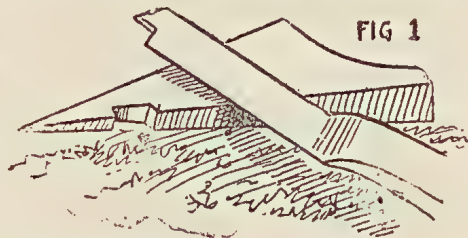
COCOANUT OIL.—£35 per ton.

General Notes.

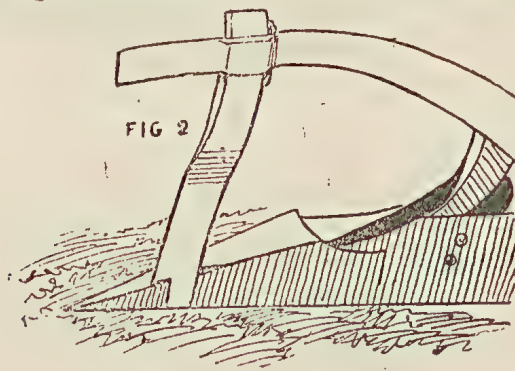
TO STRENGTHEN PLOUGH HEADS.

We illustrate here a very useful contrivance to prevent the bother, when ploughing, of the plough head breaking. The illustration and description of the method are taken from the *Farmer and Stockbreeder*:—

Amongst roots or hard ground the plough often gets strained, the beam rises, or the head holding the share will dig in, leaving the plough quite unmanageable in either case. How to prevent this is here explained. Have



the coulter fixed by dovetailing on to the land side of the share, as shown in Fig. 1. Bend the head of the coulter as far forward, when used in a mortise-beam plough, as will allow it to fix in the dovetail; this holds the beam and head together when wedged tight. It adds 50 per cent. to its strength without increasing the weight. It answers well in any kind of ground. The drawings show the dovetailing and as fixed.



COFFEE IN LONDON.

The terminal market, which is mainly influenced by the daily receipts in Rio and Santos, gave way in the early part of the week to the extent of about 6d. per cwt., says the *Produce Markets' Review* of 28th February, 1903, but since then, influenced by rumours of a combine, this was more than recovered. In our opinion the enormous weight of stocks in all parts of the world will prove too much for any such operations, and must remain so while Brazil continues to produce more than the consumption requires. Judging by the amount already received, it looks as if this crop will turn out from 11,000,000 to 12,000,000 bags, or from 1,000,000 to 2,000,000 more than is necessary, and the silence as to expectations for the next crop is ominous of another large one. At the auctions rather heavier supplies have led to a slight reduction in all but the finest qualities. At the decline there is a steadier tone and more general buying, which tends to the opinion that the interior stocks on the Continent are unduly small.

PERUVIAN OR CUZCO MAIZE.

The trials of this wonderful corn, made in other parts of the world, have not been successful. In South Africa the seeds have entirely failed to produce cobs. In different parts of Australia poor results have been obtained. But all these places have very different conditions to its native habitat, which is at a good elevation in the Andes, 7,000 and 8,000 feet. This nearly corresponds to 3,000 to 4,000 feet here. This corn grows to a great height, 20 feet and more, in situations it finds suitable.—*The Journal of the Jamaica Agricultural Society.*

TOMATO PRESERVES.

Select small, firm, ripe yellow tomatoes. Place them in a wire basket, immerse in fast boiling water for 3 minutes; then plunge into cold water. Peel and weigh, and allow 1 lb. granulated sugar to every 1 lb. fruit. Put a layer of tomatoes in a preserving-kettle and sprinkle it with some of the sugar, then add another layer of tomatoes and more sugar. When all is used heat very slowly and boil until tomatoes are tender. Then skim them out and boil down the syrup until as thick as desired. Return the fruit to the syrup and bring to the boiling point. Put in small jars. When filling, distribute slices of lemon through each jar.—*American Agriculturist.*

SOME GOOD RAT POISONS.

CARBONATE OF BARYTA.

Mealie meal, oatmeal, or wheat flour	...	...	6 oz.
Sugar	...	...	6 oz.
Carbonate of baryta	...	...	4 oz.

Anise-seed oil sufficient to give mixture a strong odour.

TARTAR EMETIC.

Tartar emetic	...	...	1 part.
Mealie meal, oatmeal, or flour	...	...	1 part.

Beef or mutton suet sufficient to make into a paste.

FRENCH PASTE.

Mealie, or oatmeal, or flour	...	...	3 lb.
Indigo (powdered)	...	...	$\frac{1}{2}$ oz.
Arsenic (powdered white)	...	...	4 oz.
Anise-seed oil	...	...	$\frac{1}{2}$ dr.

Mix together and add $2\frac{1}{2}$ lb. of melted beef, suet, or tallow, and work whole into a paste.

THE VALUE OF FRUIT JUICES.

An eminent Japanese bacteriologist, Professor Kiosoto, in agreement with Professor Koch and other scientists, have, says the *California Fruit Grower*, shown that the acids of lemons, apples, and other fruits—citric acid and malic acid—are capable of destroying all kinds of disease germs. Cholera germs are killed in 15 minutes by lemon juice or apple juice, and typhoid fever germs are killed in half-an-hour by these acids, even when considerably diluted.

If you squeeze a lemon in a glass of water containing cholera germs, and let it stand 15 or 20 minutes, you may drink the water with impunity, as the germs will be dead. These juices will kill other disease germs. Instead of telling a man to have his stomach washed out we can now tell him to drink fruit juice, which will cleanse the stomach as well as a stomach-tube, provided it is not a case of gastric catarrh.

In ordinary cases of biliousness, foul tongue, bad breath, sick headache, and nervous headache a fruit diet is a wonderful purifier. The fruit diet will cleanse the stomach and the alimentary canal and drive off disease germs, which are responsible for a large share of our ailments.

TO PICKLE ROSELLAS.

Remove the capsule, wash the fruit, let drain to dryness, then sprinkle salt over the part to be used. Mix the mass up carefully by hand, so as to allow the salt to penetrate equally through the whole. Let stand over night if for home use; if for sale, and for lengthened keeping, a longer period of salting is advisable. Boil the vinegar, in which a few peppers and a little allspice should be added according to taste. Then, when ready to bottle, add the vinegar before quite cold. Some prefer the vinegar poured in the bottles when hot, but in so doing there is a tendency in the rosella to lose its crispness, a quality necessary in good pickles. Adding the vinegar when cool, or even cold, will keep the pickle crisp and of a good colour. Cork soundly, seeing your corks are of good material, otherwise your article will not keep.

A correspondent advises as follows:—Gather the rosellas as soon as they reach maturity, before they become fibrous. Carefully remove the seed-vessels. Put the rosellas in the pickle bottles. Boil some whole pepper, cloves, and any other spices preferred—with a little salt—in the vinegar, and when cool pour over the rosellas and seal. Ready for use in a fortnight.

PIGNON D'INDE.

Mr. F. Pastournel, of Mackay, writes definitely on the above much-debated plant, from his own knowledge of it. It is nothing more, he says, than the *Croton Tiglium*, which grows well in the Northern portion of the State, the seeds of which plant are used for making croton oil. The tree is also employed in Mauritius as a support for the vanilla vine, as it has a thick bark, and the vanilla planted at its base clings to it and feeds upon the bark. The *Albizzia Lebbeck* mentioned by Mr. Ehrmann is our last issue (Bois noir, or black wood), which grows to a great size in Mauritius, Mr. Pastournel thinks, would not be a success here, as the tree is already in Queensland, and twenty-seven years' growth has not sufficed to give it diameter enough to make an 8-inch nave for a wheel. The oak-tree (Casuarina), which grows to an enormous size in Mauritius, is here only large enough to make excellent firewood. A plant our correspondent highly recommends is the acacia, which grows wild in Mauritius. It affords a splendid fodder for cattle, sheep, goats, and pigs. No drought is severe enough to kill it. It can be cut every year. The wood, when dry, makes excellent fuel, as the stumps shoot anew with greater vigour as the tree grows older. The only inconvenience about it is that when horses begin to eat it they lose their mane for a time until they are used to it. Another tree as good as the acacia is the *Bois d'oiseaux*."

[We thank Mr. Pastournel for his information. The acacia grows freely in gardens and streets in Western Queensland; and if the *Bois d'oiseaux* is the Bird of Paradise tree, this also grows profusely at Barcaldine and elsewhere. Our correspondent is correct in his assumption that Mr. Ehrmann lived a long time in Mauritius.—Ed. Q.A.J.]

RENOVATING A PEPPERINA-TREE.

Mr. T. M. Donovan, head teacher of the Freestone State school, sends us the following amusing sketch of his treatment of a pepperina-tree. We do not often indulge in pleasantry in these pages, but, recognising that "a little nonsense now and then is relished by the wisest men," we give space to Mr. Donovan's little story:—

My predecessor at the Government residence planted two peach-trees at the back of the house, and wanting, I suppose, to get the full value of the space at his disposal, planted a pepperina at the apex of a 6-foot triangle thus formed between the two. All three flourished equally for the first two years, but during the long drought the pepperina took immense strides ahead, and at the end of last year had completely overshadowed the two peaches. Of course the space given to the three trees was barely sufficient for the full development of one.

The problem for me was—how to step in and prevent the cruel struggle for existence, which, from the sturdy growth of the one and the stunted growth of the others, I could see would end disastrously for the two peach-trees.

By pruning and training I got the latter to develop their heads away from the shadow of the young and vigorous monster. But to no purpose; for, though they lived and put forth leaves and a few fruits which never ripened, the “root of the matter” remained untouched. The battle was fought in silence down below, and it was only a question of time until the only two peach-trees the garden boasted would be left deformed, undeveloped, and unfruitful.

You will say, “Why not transplant the two peach-trees?” Well, because the original sinner planted them close beside a paling and wire fence. I would have to cut the wire, and pull down the fence. Further, the fence was not my own, and my amateurish work would be sure to spoil it; and, further still, I should probably kill the two in the transplanting. I thought over the matter long and seriously, for I am very fond of peaches. I argued the question *pro* and *con*—in my mind, of course—for my wife believes strongly in the pepperina for the shade on washing days.

Two and a-half years ago I myself planted three pepperinas to cut off the cold westerlies, and after the rains of last December I planted three more in various positions around the house. Lately I cut down and carted away the remains of four beautiful trees that the drought had killed, but immediately planted others in their place. My cabbage and cauliflowers were blooming, my carrots, parsnips, and onions were showing up bravely, and my barley patch was a thing of beauty—all this was the result of hand-digging with the fork. On the strength of such good and useful work, I seriously thought, although it cost me many a pang, that I had a perfect right to tomahawk the offending pepperina that was killing my only peach-trees.

Very guardedly I hinted at the “murder” to my wife, but the emphatic way she put the ghost of a suggestion aside, without considering even the possibility of such a thing, gave me fair warning that I had to think out this problem for myself.

Well, to make a long story short, one evening when my wife was out at a neighbour's for afternoon tea I took heart of grace—took the bull by the horns, and with a tomahawk cut a deep ring round the butt of the wife's wash-house—the too vigorous pepperina. I made the chips fly, and cut deeply in. Another round and it would tumble down; but, although I thought I made sure of its ultimate death, I had not courage to finish the murder. Being a man of peace, I wanted to break it gently to the wife, for there is no knowing what would happen should she come suddenly in and find the tree on the ground.

As it was, when she did come, and saw the chips and the white wound—but no, I must draw a veil over that interview, and suppress the floods of sarcasm which she poured on my devoted head. After tongue-threshing me with withering contempt for such vandalism, she wound up by expressing it as her opinion that I was no true Milesian at all, but a lineal descendant of some prehistoric Firbolg or cave-man, whose primitive instincts—red in tooth and claw—urged him to slay every living thing for the sake of merely gratifying his lust for blood!

At tea she spoke more calmly, pointed out how useful that particular pepperina had been to her, and, worst of all, solemnly forgave me for what she considered an extremely foolish action. While she was thus gently chiding me I was gazing guiltily at the big white wound in the tree that was opposite the window near which I sat. I had no appetite for my food, for I was by now, when it was too late, almost certain that I had done wrong. The reader who has had to kill a favourite dog will understand how I felt.

That night I could not sleep, thinking sadly of my impulsive and rash act. It was not my wife now that was reproving me, but my own conscience. In the darkness of the night it rose up and accused me of brutal selfishness and savagery. It plainly said: “You are a nice husband to cut down a tree that gave a welcome shade to your hard-working wife on washing days. For what?”

Ah! you selfish person—for what? To fill your greedy stomach with peaches! I felt crushed, guilty, and could not answer a word, for a neighbour had informed me after the wicked deed was done that the peach-trees were of a very common and almost worthless kind.

Early the following morning I stole quietly out of bed, gathered the biggest of the chips and the largest pieces of bark, and plastered them around the gaping ring. I then cut two large strips of bark from the trunk further up, and placed them at either side overlapping the wound. I made all fast with sacking and twine. I had read a few days previously, in the *Queensland Agricultural Journal*, of the plan of giving water to trees through the branches; so I got a box, and, placing a kerosene tin of water on it, cut the top off a drooping branch and let it dip into the water. Whether the tree took an appreciable amount of water through the limb, or that this plan helped to save the tree, I cannot say for certain. Anyway, the tree is now alive and kicking—as green and as healthy as any of its mates; the wound is healing rapidly, and, better than all, my wife has just remarked that I am not such a bad sort of Carlylian fool after all, for I had the good sense to repair the mischief I had done. It is now more than a month since the evil deed was perpetrated, but, as the tree is not showing the least sign of decay, I can now breathe freely once more, and leave the question of the survival of the fittest to Nature.

GRAPE JUICE.

Here is the best recipe for making unfermented wine ever known. Take $\frac{1}{2}$ -gallon self-sealing jars, put in one layer of good ripe grapes picked off the stem and one layer of granulated sugar. Make layer of grapes about 2 inches thick and layer of sugar $\frac{3}{4}$ -inch thick. Put in a layer of grapes and one layer of sugar, one after the other, until jar is full; then seal up tight and set in dark cellar about the 1st of January. Strain through cheesecloth by dripping all night. Do not press the grapes, as this gives a bitter taste. Then put in any kind of bottle, and I will say you can keep it 10 years. I make mine this way every year, and I have as good a wine as anybody, and other people say the same.—W. H. Spybeg, Kentucky, in *American Agriculturist*.

Agricultural Patents.

PATENTS ACCEPTED.

6847: John Cox, of Broadway, New Glenelg, South Australia, Australia, gardener. "Improvements in and relating to Rock Drilling and Earth Boring and Means for Withdrawing Earth and other Matters from the Bore." Dated 6th September, 1902.

6925: The Cotton Seed Company, Limited, of 37 Old Jewry, London, England (assignees of John Charles William Stanley, engineer, of 36 Lime street, London, England). "Improvements in or relating to the Treatment of Cotton Seed." Dated 30th October, 1902.

6940: James Burge, of Victoria street, Warragul, Victoria, Australia, saddler. "An Improved Rug for Cows, Horses, and like Animals." Dated 11th November, 1902.

6948: The Wolseley Sheep Shearing Machine Company, Limited, of Sydney Works, Alma street, Birmingham, England, manufacturers, and Herbert Austin, of the same address, a director of the said company (assignees of Herbert Austin). "Improvements in Machines for Cutting or Shearing Hair or Wool." Dated 13th November, 1902.

6534: Michael Daly, of Longreach, Queensland, acting sergeant of police. "Improved Means for Raising Water and other Liquids." Dated 22nd March, 1902.

Answers to Correspondents.

A CLOCK SUM.

PUBLIC SERVICE EXAMINEE, LISMORE.—We do not undertake to answer questions which can be solved by reference to any work on algebra. The mathematical questions you mention as being answered in the *Journal* are only such as have reference to the measurements of stacks, dams, tanks, corn-bins, &c. We will, however, give you the solution you ask for, but no such questions will be answered in future, as the *Journal* is not intended to teach mathematics.

Question.—The hands of a clock are opposite to each other between 3 and 4 o'clock. What time is it?

ON is the position of the minute hand.

OD is the position of the hour hand.

M is the 12 o'clock point.

T is the 3 o'clock point.

Now, OM, OT represent the position of the hands at 3 o'clock.

Call x the number of minutes past 3 o'clock.

MDN may represent x

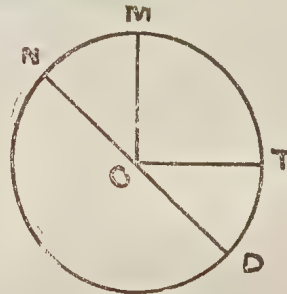
Then TD represents $\frac{x}{12}$

MT „ 15

DN „ 30

MDN = MT + TD + DN

or $x = 15 + \frac{x}{12} + 30$



$\therefore x = \frac{540}{11} = 49\frac{1}{11}$ minutes past 3, or $10\frac{10}{11}$ minutes to 4.

GUM AND BLOODWOOD SAPLINGS—KILN FOR DRYING MAIZE— POST-HOLE DIGGER.

C. V. H., Cairns.—

1. If you have 500 acres of good saplings, and you do not particularly require the land for grazing purposes, it would be well to work the property as a forest, which, provided you have facilities for carriage, will become more valuable eventually than if the land were merely used for grazing purposes. Good timber will be becoming increasingly scarce, and correspondingly dear. Consider the enormous quantity of railway sleepers which will be required for new railways, and for renewals within the next 20 years. Piles, stringers, and planking for bridges alone will require the produce of thousands of acres of forest timber. Scaffold poles, which are and will always be in demand, together with piles for wharves and houses, will repay the cost of thinning out the forest. As settlement increases, miles of fence posts and many rails will be required. With the increase of population, the demands of the sawmills will yearly be greater. So that a well-grown forest of hardwood, judiciously managed, may be worked into a source of income which will never fail.

So far back as 1896, the quantities of hardwood sold in the log in the whole State reached 30,351,000 feet; of cedar, 1,732,000 feet; pine, 45,233,000 feet. The average prices paid per 1,000 feet were:—Hardwood, £2 11s.; cedar, £3 0s. 6d.; pine, £2 1s. 10d.

A mill cutting 10,000 feet (log measurement) weekly would require annually, to keep it in full work, 4,194 logs, 20 inches in diameter, 2,911 logs of 24 inches, 1,303 logs of 36 inches, 631 logs of 60 inches, and 597 logs of 66 inches diameter.

There must be some 120 or 130 sawmills at work in the country. How long will it be before our scrubs and forests are denuded of marketable timber, if no provision is made for a continuous supply? Suppose you were to thin out the timber on the 500 acres so as to leave the remaining trees at distances of 20 feet apart. The number of trees per acre would be 108, or a total of 54,000 trees.

Hardwood trees are of slow growth, but sales may be made of the thinnings as the work proceeded. Meanwhile, the rest of the timber would be slowly growing. At what rate? When the tree has finished its height growth, which will be more or less rapid according to soil, situation, and climate, it begins to make lateral growth. This may be reckoned at about 12 inches in 20 years. Tasmanian gums will in that time make a height growth of from 14 to 35 feet, and will have a diameter of from 8 to 12 inches at the smaller end. Sugar-gums will reach the same size in 15 years. Flooded gums take the same time. The stringybark and bloodwood, when 35 years old, will have a diameter of 2 feet and a height varying from 60 to 100 feet. The young plants will grow to a height of from 4 to 7 feet in 16 months.

As for the soft woods, the Kauri pine makes little wood until it has shot up so as to top the rest of the scrub. It will then have a diameter of about 12 inches. From this period the yearly growth is from $1\frac{1}{2}$ to 2 inches in diameter. As the tree reaches from 40 to 50 inches in diameter the growth slackens off, but does not cease.

Hoop pine increases at the rate of $\frac{3}{4}$ -inch per annum, and tops the scrub at 10 inches. The cedar makes three growths, equivalent to an increased diameter of 2 inches, in every 3 years.

A tree, hardwood or pine, 20 inches in diameter, will yield, in a 60-foot log, 1,124 feet (super.) of timber, and if allowed to grow to a diameter of 3 feet, the yield will be 3,644 feet. In your climate, the timber would grow very fast when young, and would probably increase in girth in a less time than I have stated. They would, of course, increase more slowly in girth after attaining a diameter of 2 or 3 feet.

POST-HOLE DIGGER.

2. There is an American machine for digging round post-holes, about 6 inches in diameter, which can be obtained from most merchants dealing in machinery. It consists of two semi-circular spades, which are worked by a spring leading up the handle. When open, it is jumped into the ground. Then the spring is pressed, which closes the spades tightly on the soil, which is withdrawn on lifting up the tool. Thanks for your information *re* cattle that never drink. Our opinion of a man, who, during the drought, could keep cattle and horses 6 weeks in a paddock without water, is not an exalted one. Daily feeds of pumpkins would not, to our thinking, supply the needed moisture.

KILN FOR DRYING MAIZE.

3. We know of no device for drying maize in the cob. A hot-air kiln might be successful, but we have never heard of maize in the cob being kiln dried. Wheat, oats, and also maize (shelled) are kiln dried in other countries.

DISTANCE APART FOR FRUIT TREES.

ALBERT W. F. BRANDT, Coolabunia.—Apples, plums, apricots, peaches, and citrus fruit trees should be planted 30 feet apart each way in good strong soil. Other crops may be grown between them for the first few seasons, provided that cultivation is thorough and manure is added to keep up the quality of the soil. Work the land deeply.

RESIN AND SODA FOR CABBAGES.

FARMER, Toowoomba.—For aphids only on vegetables apply $\frac{1}{4}$ lb. whale oil soap, 3 oz. tobacco extract, and 1 gallon water. Dissolve the soap in hot water, add the tobacco extract, and spray on.

For Cabbages and Cauliflowers.—20 lb. resin, 4 lb. caustic soda (98 per cent.), 3 pints fish oil, and 140 to 150 gallons water. Boil steadily for three hours. Do not add cold water on any account while hot, or the resin will be precipitated, and give trouble. Add water, when cold, to make up the quantity after boiling. Apply with a spray pump and triple cyclone nozzle. If a less quantity is required, reduce the ingredients proportionately. The firms dealing in artificial manures are Messrs. Webster and Co. and E. Rich and Co., Brisbane, and Messrs. Geo. Shirley and Co., Sydney.

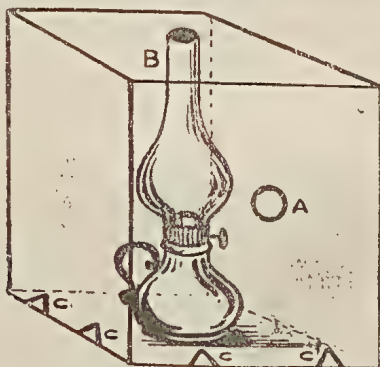
PRESERVING AND TESTING EGGS.

JOHANNES LEHMANN, Aloomba, Cairns.—Mr. Hinds, Poultry Expert at the Queensland Agricultural College, replies to your questions as follows:—

(a) It is quite sufficient to put the eggs one on top of the other in a tin or barrel; so long as you keep them well covered with the liquid, it does not matter whether the barrel be full of eggs or not.

(b) Common eggs, bought in the market, are unreliable, as some of them may be bad when put in; these would certainly cause others to go bad. The best results are obtained when the eggs are put in the same day as they are laid.

(c) I enclose pattern of egg-tester. Get a box 1 foot square and the same in height, or, rather, about high enough for an inch of the globe of a lamp to come through the top, as shown at B in the illustration. A is a hole the size of



an egg, over which a piece of black cloth is fastened, and the hole also cut into the cloth, so as to fit snugly around the edges of the egg. C C are holes to let air into the lamp. All that is necessary is to place the box over the lamp, as the box should have no bottom. Be careful to allow no light to show except at the opening where the egg is held. Hold the egg close to the opening, the large end up; look through it at the light after the eggs have been in the incubator or under the hen for a week. Clear eggs are infertile, dark eggs contain chicks, unless rotten. Turn the eggs round from left to right, or *vice versa*, and the examination will be easier. A lamp reflector at the back of the box is an improvement.

(d) I would not recommend keeping the eggs 4 or 5 days, as, if they are kept so long in hot weather they may possibly start to hatch through several hens going to the same nest to lay, as is often the case. Any eggs that have started to hatch would be sure to go bad, and might spoil a large percentage. Eggs from hens running without a male bird are really the best for preserving, as there is no germ, and they will in consequence keep for a much longer period.

(e) The eggs packed as in Question (a) would not stand shipping, as they would most likely get broken in transit.

ANGORA GOATS.

A. B., Stonehenge.—Your letter of — April only reached this office on 29th April, too late for a reply even in the May issue. Please note that communications requiring a reply in the *Journal* must reach us at latest on the 20th of the month.

1. The cost of obtaining a pure Angora buck through the Agricultural Department would depend upon the selling price and the distance by rail or steamer on which freight would have to be paid. Messrs. Kidman and Kempe, Warrina, South Australia, have sold pure bucks at £8 8s. each.

2. The question of the power of the Divisional Board to rate a flock of goats running on a selection is a matter for the board to decide.

3. The Lands Department make no concession on land taken up for goat-farming.

4. We understand that cross-bred ewes are the best milkers.

5. Poley goats are new to us. We cannot tell you if they are of a separate breed.

REDWATER, OR TICK FEVER.

COCKIE, Bundaberg.—In reply to your very serious question as to what means can be adopted for the prevention or cure of redwater, we are advised by the Chief Inspector of Stock that dipping will not prevent the occurrence of tick fever (redwater), but it will greatly minimise the mortality by preventing gross infestation. Although many experiments have been made in Queensland, the United States, and Argentina, to treat cattle suffering from the fever, none have been attended with any success. The only treatment found of value is to place the fevered cattle on green pasture, near clear water, and leave them undisturbed. It has been pointed out in this *Journal* that in Argentina, cattle infested with ticks when placed in large lucerne fields become perfectly free from them.

"FARMER," Kerry.—Not having given us his name, we are unable to comply with his request for the *Journal* and Bulletin he asks for.

PRUNING ROSE-TREES.

W. H. FRANCIS, Cressbrook.—As roses grow freely here during the greater part of the year, it is best to give a light pruning after each blooming period. If plants require a heavier pruning, watch for a time during the coming winter months when the growth is stagnant.

CABBAGES RUNNING TO SEED.

NIL DESPERANDUM, Geham.—There is no reason why cabbages, if properly attended to and kept growing, should go to seed before maturing, if sown in July in cool districts above the Range. Early varieties, such as "Succession," should be planted.

GUMMING IN PEACH-TREES—SISAL HEMP.

J. EMMERSON, Crows' Nest, Toowoomba.—

1. Gumming may be the result of bad drainage, notwithstanding the recent drought. Bad drainage means a merciless binding up of the soil in drought time, which has a very bad effect on trees. Further, spasmodic efforts at growth during dry seasons sometimes result in gumming. Remedy: Drain, if required, cultivate deeply and thoroughly. Paint the trunks and limbs with the following mixture, as a preventive against insects, which may have caused the trouble:—Boil 2 lb. sulphur and 1 lb. stone lime gently in 2 gallons of water for 1½ hours. Then add 3 lb. more lime, and boil for half-an-hour. If the wash threatens to overflow, stir in some cold water. Thicken with fine clay or flour to make a good paint.

SISAL HEMP.

2. For full information on sisal hemp, see *Journal*, Vol. I., p. 382, Vol. IX., p. 488. The price in London is always given in "Price List of Queensland Produce in London." In Melbourne it is said to be worth £30 per ton.

The Markets.

TOP PRICES FOR FRUIT—ROMA-STREET MARKETS.

Article.	APRIL.	
	Top Prices.	
Apples, Eating	8s.	6d.
Apples, Cooking	7s.	6d.
Apples, American, Eating ... ..	...	...
Apples, American, Green ... ..	...	...
Lemons, Italian, per 360	23s.	...
Lemons, Italian, per 180	12s.	6d.
Lemons, American, per 180 ... ..	...	...
Lemons, New South Wales	10s.	6d.
Oranges, Italian	10s.	...
Oranges, Local	6s.	...
Mandarins, Local	13s.	...
Apricots, New South Wales, boxes (half-gincase) ... ..	...	...
Apricots, Queensland, half-case ... ..	...	...
Plums, half-gincase ... ..	...	...
Peaches, half-gincase ... ..	...	...
Nectarines, half-gincase ... ..	...	...
Gooseberries, English ... ..	...	...
Cherries ... ..	...	...
Passion Fruit, quarter-case	2s.	6d.
Mangoes ... ..	...	...
Pineapples, rough	3s.	6d.
Pineapples, Queen	6s.	...
Melons, per dozen	2s.	6d.
Rockmelons, per dozen	1s.	6d.
Bananas, per bunch (local)	1s.	6d.
Bananas, per dozen (Northern)	2½d.	...
Pears (Tasmanian), quarter-case	6s.	6d.
Pears (Victorian), half-case (export case)	10s.	...
Grapes (South Australian), case ... ..	...	...
Persimmons, half-gincase ... ..	...	...
Custard Apples, half-gincase	3s.	6d.

AVERAGE TOP PRICES FOR APRIL.

Article.		APRIL.	
		Top Prices.	
		£	s. d.
Bacon	lb.	0	0 10
Bran	ton	6	8 9
Butter, First	lb.	0	0 11½
Butter, Second	"	0	0 9½
Chaff, Mixed	ton	5	3 9
Chaff, Oaten	"	6	10 0
Chaff, Lucerne	"	4	15 0
Chaff, Wheaten	"	5	11 3
Cheese	lb.	0	0 8
Flour	ton	13	0 0

AVERAGE TOP PRICES FOR APRIL—*continued.*

Article.							APRIL.		
							Top Prices.		
							£	s.	d.
Hay, Oaten	...	...	...	...	...	ton	5	10	0
Hay, Lucerne	...	...	...	...	...	"	3	11	3
Honey	...	...	...	...	...	lb.	0	0	2 $\frac{1}{2}$
Rice, Japan (Duty paid)	...	...	...	...	...	ton	22	7	6
Maize	...	...	...	...	...	bush.	0	4	6
Oats	...	...	...	...	...	"	0	4	0
Pollard	...	...	...	...	...	ton	8	10	0
Potatoes	...	...	...	...	...	"	4	12	6
Potatoes, Sweet	...	...	...	...	...	"	2	1	3
Pumpkins	...	...	...	...	...	"	2	0	0
Sugar, White	...	...	...	...	...	"	20	15	0
Sugar, Yellow	...	...	...	...	...	"	18	2	6
Sugar, Ration	...	...	...	...	...	"	15	0	0
Wheat	...	...	...	...	...	bush.	0	6	6
Onions	...	...	...	...	...	cwt.	0	4	8 $\frac{1}{2}$
Hams	...	...	...	...	...	lb.	0	1	1
Eggs	...	...	...	...	...	doz.	0	1	4 $\frac{1}{2}$
Fowls	...	...	...	...	...	pair	0	3	9 $\frac{3}{4}$
Geese	...	...	...	...	...	"	0	6	1 $\frac{1}{2}$
Ducks, English	...	...	...	...	...	"	0	4	3
Ducks, Muscovy	...	...	...	...	...	"	0	5	1
Turkeys, Hens	...	...	...	...	...	"	0	7	9 $\frac{3}{4}$
Turkeys, Gobblers	...	...	...	...	...	"	0	15	0 $\frac{3}{4}$

Times of Sunrise and Sunset, 1903.

DATE.	MAY.		JUNE.		JULY.		AUGUST.		PHASES OF THE MOON.	
	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.	Rises.	Sets.		H. M.
1 ...	6:16	5:14	6:33	4:58	6:43	5:0	6:33	5:14	4 May) First Quarter	5 26
2 ...	6:17	5:13	6:33	4:58	6:43	5:0	6:32	5:15	11 " ○ Full Moon	11 18
3 ...	6:18	5:12	6:35	4:57	6:43	5:1	6:31	5:16	19 " ☾ Last Quarter	1 18
4 ...	6:18	5:12	6:35	4:57	6:43	5:1	6:30	5:17	27 " ● New Moon	8 50
5 ...	6:19	5:11	6:36	4:57	6:43	5:1	6:30	5:18	1 " Perigee	3 0
6 ...	6:19	5:10	6:36	4:57	6:43	5:1	6:30	5:18		
7 ...	6:20	5:9	6:36	4:57	6:43	5:1	6:28	5:19		
8 ...	6:21	5:8	6:37	4:57	6:43	5:2	6:27	5:19	2 June) First Quarter	11 24
9 ...	6:21	5:6	6:37	4:57	6:43	5:2	6:27	5:19		
10 ...	6:22	5:6	6:38	4:57	6:43	5:3	6:26	5:20	10 " ○ Full Moon	1 8
11 ...	6:22	5:6	6:38	4:57	6:43	5:3	6:25	5:20	18 " ☾ Last Quarter	4 44
12 ...	6:23	5:5	6:38	4:57	6:43	5:4	6:24	5:21	25 " ● New Moon	4 11
13 ...	6:24	5:5	6:39	4:57	6:42	5:4	6:23	5:22		
14 ...	6:25	5:4	6:39	4:57	6:41	5:5	6:23	5:23		
15 ...	6:25	5:3	6:39	4:57	6:41	5:7	6:21	5:23	2 July) First Quarter	7 2
16 ...	6:25	5:3	6:39	4:57	6:41	5:7	6:21	5:23	10 " ○ Full Moon	3 43
17 ...	6:25	5:3	6:39	4:57	6:41	5:7	6:21	5:23	18 " ☾ Last Quarter	5 24
18 ...	6:26	5:2	6:40	4:58	6:41	5:7	6:20	5:24	24 " ● New Moon	10 46
19 ...	6:26	5:2	6:40	4:58	6:41	5:7	6:20	5:24	31 ") First Quarter	5 15
20 ...	6:27	5:1	6:41	4:58	6:40	5:8	6:18	5:24		
21 ...	6:27	5:1	6:41	4:58	6:40	5:8	6:17	5:25		
22 ...	6:27	5:1	6:41	4:58	6:39	5:9	6:16	5:26		
23 ...	6:29	5:1	6:42	4:58	6:38	5:10	6:15	5:27		
24 ...	6:29	5:1	6:42	4:58	6:38	5:10	6:14	5:27	8 Aug. ○ Full Moon	6 54
25 ...	6:30	5:0	6:42	4:58	6:37	5:11	6:13	5:27	16 " ☾ Last Quarter	3 22
26 ...	6:30	5:0	6:42	4:58	6:37	5:11	6:13	5:27	23 " ● New Moon	5 51
27 ...	6:30	5:0	6:42	4:58	6:37	5:11	6:12	5:28	30 ") First Quarter	6 34
28 ...	6:31	4:59	6:43	4:59	6:36	5:12	6:11	5:30		
29 ...	6:31	4:59	6:43	4:59	6:36	5:12	6:10	5:30		
30 ...	6:32	4:58	6:43	5:0	6:35	5:13	6:7	5:31		
31 ...	6:32	4:58	...	...	6:34	5:14	6:6	5:31		

Orchard Notes for June.

By ALBERT H. BENSON.

The marketing of citrus fruits is still one of the principal operations in many orchards throughout the State, and the remarks anent this matter that have appeared in these notes for the past two months should be borne in mind and acted upon, as, no matter what the quality of the fruit may be, it always sells best when well packed and attractively got up, as the better it looks the better it sells.

I cannot lay too great stress on the extreme importance of handling the fruit carefully and of sweating it prior to shipment. The common practice of pulling the fruit from the tree and packing and shipping it straight away is responsible for a very large proportion of the loss so commonly met with in marketing the fruit early in the season. The skin in the earlier stages of ripening is rigid and full of moisture, so that it is easily bruised, the cells of the skin being ruptured. Fungus growths of various kinds attack the injured skin, with the result that the fruit soon becomes completely rotten, and is covered with a mass of greenish or bluish mould. This loss can be reduced to a minimum by cutting the fruit instead of pulling it, and by handling it like eggs instead of like road metal. In addition to the ordinary loss on the fruit by bad handling a further loss takes place when it is found necessary to cyanide the fruit, as, for example, when it has to be shipped to the Southern States, as the gas at once finds out every bruise, case-mark, or injury to the skin, such as plugging—viz., pulling the stem out—and turns the same black, thereby greatly detracting from the value of the fruit.

In many parts of the State deciduous fruit trees should be pruned during the month, and I strongly advise fruit-growers to read my remarks on this subject which appeared in a previous issue of this *Journal*, as thorough pruning is seldom carried out, many trees being allowed to grow of their own sweet will without let or hindrance. This neglect to properly prune fruit trees is conducive to the rapid spread of many insect and fungus diseases, as when trees are allowed to grow into a dense bush it is impossible to keep them clean by means of any of the ordinary methods adopted for the eradication of disease, such as spraying, &c.; and when they are allowed to straggle all over the place the straggling limbs are very apt to become more or less diseased.

Old neglected trees of good varieties, and of which the roots are still healthy, should be cut hard back, and all dead, broken, or badly diseased branches should be cut off and a new head be allowed to form; but where such trees only produce inferior fruit that is of no commercial value, they should be either destroyed or, if wished, they may be grafted on next spring with good valuable varieties. Old neglected trees are the breeding-grounds of many diseases, and when they are of no value whatever they should be destroyed, as they are a menace and source of infection to the neighbourhood in which they are growing.

Do not be afraid to prune too heavily, as it is better to lose a crop and thereby get your tree or trees into a healthy state than to leave them in an unhealthy and unpruned condition and get a poor crop of inferior fruit. Prune hard, and gather up and burn all prunings; do not let them lie about, but burn them up, as by doing so any diseases that may be on the wood that has been pruned off will be destroyed. Where trees are hard cut back and only the main limbs are left, it is advisable to follow up the same pruning with a dressing that will destroy all insects or fungus pests still remaining on the tree, and for this purpose the best remedy is to paint the stems and branches with the following mixture, prepared thus:—Boil 2 lb. of sulphur and 1 lb. of quicklime in 2 gallons of water for about one hour, then add fine clay to the mixture till it is as thick as paint, and apply with a brush. Fine flour can be used in the place of the clay if desired, and will render the mixture more lasting.

Where San José, Greedy Mussel, or Parlataria Scales are present, this method of treatment is the most efficacious, and is even better than spraying with the sulphur, lime, and salt wash mentioned in my pamphlet on spraying.

This mixture is also of value for painting the stems and main branches of citrus-trees covered with mosses or lichens, or attacked by White, Red, Circular, Black Mussel, or other scale insects.

Where the ground is ready, plant deciduous trees this month; do not plant too deep, and cut back hard at planting. Clean up the orchard thoroughly, and plough and leave the ground rough as soon as the trees are pruned and the prunings are burnt. Gather up and destroy all fly-infested fruit of all kinds, as the more thoroughly the fly is kept down during the winter on the coast, the fewer flies there will be to deal with in spring. Where not already done, see that pineapples are protected from frost, and keep the ground between the plants well worked in order to retain moisture, as the winter months are usually dry and the plants are liable to injury through drought. The same remarks apply to bananas, and the unripe bunches of fruit should be protected from slight frosts or cold spells by any suitable available material.

Farm and Garden Notes for July.

FIELD.—With a fairly good season, the field operations generally for the month will consist of preparing the land for potatoes, maize, oats, barley, vetches, rye, tobacco, sugar-cane, field carrots, mangolds, &c. Prairie and other grasses, if not already sown in March and April, may yet be sown. In suitable localities, early potatoes may be planted, but the young shoots will run the risk of being nipped by frost. There is no better time for sowing lucerne. The soil should be a deep, calcareous loam, where the roots can penetrate deep down into the subsoil in search of moisture and plant food. If the subsoil is at all tough, it should be loosened to at least a depth of 18 inches, by the help of the subsoil plough; but on no account should the subsoil be brought to the surface. The land must be brought to the finest possible tilth, to give the seed every chance of germinating. After sowing, run a light harrow over the land to cover the seed. From 10 lb. to 12 lb. of seed is sufficient for an acre. During suitable weather, rice may be sown in the North and on the Southern Coast. The coffee crop should now be harvested. Yams and turmeric should be unearthed.

KITCHEN GARDEN.—Full sowings may be made of cabbage, carrot, broad beans, lettuce, parsnips, beans, peas, radishes, leeks, spring onions, beetroot, eschallots, mustard and cress, &c. As westerly winds may be expected, plenty of hoeing and watering will be required to ensure good crops. Pinch the tops of broad beans which are in flower, and stake up peas which require support. Plant out rhubarb, asparagus, and artichokes. In warm districts it will be quite safe to sow cucumbers, marrows, and squashes during the last week of the month. In colder localities it is better to wait till the middle or end of August. Get the ground ready for sowing French beans and other spring crops. Plough up or dig all vacant land, and let it lie in the rough until required. If harrowed and pulverised before that time, the growth of weeds will be encouraged, and the soil is deprived of the sweetening influence of the sun, rain, and air.

FLOWER GARDEN.—The roses will now want looking after. They should have already been pruned, and now any shoots which have a tendency to grow in wrong directions and to crowd the centre of the bush should be rubbed off. Overhaul the ferneries, and top dress with a mixture of sandy loam and leaf mould, staking up some plants and thinning out others. Treat all classes of plants in the same manner as the roses where undesirable shoots appear. All such work as trimming lawns, digging beds, pruning, and planting should now be got well in hand. Plant out antirrhinums, pansies, hollyhocks, verbenas, petunias, &c., which were lately sown. Sow zinnias, amaranthus, balsam, chrysanthemum tricolor, marigolds, cosmos, coxcombs, phloxes, sweet peas, lupins, &c. Plant gladiolus, tuberose, amaryllis, paneratium, ismene, crinum, belladonna, lily, and other bulbs. Put away dahlia roots in some warm, moist spot, where they will start gently and be ready for planting out in August or September.

Royal Botanic Gardens Victoria



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